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# Air Conditioning & REFRIGERATION

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## Inside Dope

By George F. Taubeneck

Attention: Inventors  
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Aerial Blood Plasma  
B-29 Gets Cooling  
Frigidare & the B-29  
Back With Carrier  
Electric Power  
Export Statistics  
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### Attention: Inventors

This industry has more than its share of successful inventors, and rightly so, because it is so new. And these inventors have made some marvelous contributions to the winning of the war. But there is more to be done.

Army and Navy materiel men send out a hurried S.O.S. through media like the News for a number of badly-needed new devices. One should be right in our province. It is a gas with an extremely low freezing point for the inflation of life rafts.

It seems that when aviators are forced to bail out of their planes at high altitudes the gas now used for inflating their life rafts (carbon dioxide) is frozen, and parachutists come down so fast that the inflating agent doesn't thaw out in time to be of any use.

Something else on which our inventors might help: an artificial fog which would remain stable; also a means for dispersing artificial fog. Still another: a gas which will control fires within a small space, such as a tank.

Those connected with our industry who are now working with radar can help by developing a device which would locate concealed enemy emplacements; also a detector for the plastic-encased land mine.

The industry's electrical men might work on a lightweight, noiseless hand generator connected to a long-beamed flashlight. Also needed: means of protection against flame-throwers and phosphorus fragments.

### New Rivet

Du Pont engineers have developed a new explosive rivet for aircraft manufacturing which deserves inquiry by many fabricators in our industry now engaged in aircraft production work (particularly since it can also be used in the making of refrigerators and radios postwar).

This new explosive rivet has a small auxiliary explosive cavity which extends from the main chamber in the shank toward the head. Thus the entire shank expands when the charge detonates. They are presently available in diameters of  $\frac{3}{16}$  and  $\frac{3}{8}$  in.

### Aerial Blood Plasma

Now in production is a new 6-cu. ft. refrigerator for keeping blood plasma in airplanes. It weighs only 25 pounds, complete with condensing unit.

Cabinet is fabricated of duralumin, with a new insulant held between twin light-gauge sheets.

Amphibious invasions result in calls for greater quantities of whole blood, too, and new aerial refrigerators for its shipment are being developed.

### B-29 Gets Cooling

Several manufacturers in the industry are taking great pride in reports of the B-29 Superfortress and its raids on Japan. Not only are some of them hard at work on component aircraft parts, but others are

## Washer Field Gets Pattern For Consumer Goods Reconversion

Order Materials Under The 'Blue Order' Plan

Produce as Soon as War Work Is Discharged

WASHINGTON, D. C.—Manufacturers of washing machines have agreed to use the WPB "Blue Order" plan for reconversion, which involves placing orders with their suppliers now in anticipation of the time when they can resume civilian production, it was revealed last week by L. R. Boulware, WPB Vice Chairman.

WPB had indicated earlier that it would discuss the possible use of this plan with the Household Mechanical Refrigerator Industry Advisory Committee.

Under the plan, members of a consumers goods industry would place orders now for deferred materials and components which could be authorized for execution at some later appropriate date. Point of this is that resumption of civilian goods production will be irregular, and possibly at a time when there are still controls over some materials and production facilities.

As long as controls would be in force, a vast amount of paper-work would have to be done by both WPB and industry. Objective of the "Blue Order" plan would be to get as much of this paper-work done right now as would be possible, and to give the supplier of parts and components an idea of what would be expected of him. It is thought that this would anticipate and prepare for bottlenecks, and would clear up questions as to needed machinery, tools, etc., through disclosure of the quantity and exact type of component required.

Such deferred orders as would be issued under the "Blue Order" Plan would make it clear that, where they are subject to WPB priority or other regulations, they are not to be executed until authorized later.

## Appliance Motors Will Follow War Orders in 60 Days

WASHINGTON, D. C.—Members of the Fractional Horsepower Electric Motor Industry Advisory Committee agreed at last week's meeting that the industry would be able to resume production of appliance motors within 60 days after military programs are cancelled.

The committee recommended that if manufacture of civilian appliances is resumed prior to the cancellation of military programs, orders for civilian purposes be identified in order that manufacturers may be in a position to prevent interference with production of any motors for the war effort.

WPB representatives told the committee that production of motors for May increased 80% over April of this year and was 20% above May, 1943. AC (alternating current) motor production for May was 50% higher than in May, 1943, and approximately 5% higher than April, 1944.

Preliminary June figures, including those for AC motors, show slight advances over May, WPB representatives said. They reported that a forthcoming order will require all users of fractional motors to report their requirements against their authorized production schedules.

It is expected that this will: (1) provide information for determining the requirements for fractional horsepower electric motors, and (2) reduce the existent large backlog of motors on order. This may turn up some motors that could be made available for new programs, WPB officials said.

Army and Navy representatives in-

WASHINGTON, D. C.—Operations Vice Chairman L. R. Boulware of WPB told the Domestic Laundry Equipment Industry Advisory Committee on July 20 that they have "a dual job"—"to continue getting out war production as long as it is needed, and to prepare now for reconversion so that the interval between war production and peace production, when the time comes, shall be as short as possible."

"Three phases of preparation are particularly urged now," Mr. Boulware said.

"First, you will want to prepare to place orders for any needed machine tools and equipment in accordance with the WPB regulation that will issue on July 29 authorizing the placement of such orders. These orders will be unrated, but we shall do everything feasible to see that you get the required deliveries, particularly in the case of tools which take a long time to build."

"Second, you will want to take such advantage as you deem appropriate of the order to issue Saturday, July 22, authorizing experimental models. Each of you must make your own guess as to the length of time you will have before your plants and those of your suppliers are clear and, consequently, as to what can be accomplished in changing from previous models during the estimated interval. There is, of course, no obligation either to stick to old models or to get out new ones. Everyone is on his own in this respect."

"Third, you will want to make informal checks now with your suppliers of materials and components, and after having done this you will want to keep in touch with them so you will know when conditions change among them to the point where they can accommodate your beginning peacetime requirements."

"The individual manufacturer will in general be permitted to go ahead with production as soon as his own plant is cleared and the complex structure of his suppliers gets free for production without interference with the war effort and without consumption of critical components on which there is a prior claim. In fact,

(Concluded on Page 2, Column 1)

## 2nd 'Reconversion' Order Out; Permits Experimental Models

WASHINGTON, D. C.—The War Production Board has issued rules under which manufacturers may be authorized to produce post-war experimental models if they do not divert manpower or facilities from war work to do so.

The rules, contained in Priorities Regulation No. 23, grant blanket authorization to any person to engage in production of models, that orders from WPB heretofore prevented them from making, provided such activity does not cost more than \$5,000 a month in a single plant, including all direct costs such as materials, components, subassemblies, labor, designing, and drafting.

Furthermore, authorization to make experimental models costing more than \$5,000 a month in a single plant may be obtained from the War Production Board by sending four copies of an application (Form WPB-3879) to the field office nearest to the plant in which the work is to be done.

The new regulation is the second step in the series of four actions re-

## Only Half of Units Needing Repairs Fixed, OCR Finds

WASHINGTON, D. C.—In a recent survey of 4,500 homes made by the Office of Civilian Requirements on the repair status of appliances, 9% of the homeowners who had mechanical refrigerators reported that repairs were required during the first three months of this year, and they reported further that only slightly more than half the repair demand was met.

"The period covered by the survey was the least active season for refrigerator repair," declared the OCR report, indicating that a greater volume of repair work could be expected—with less chance of its being taken care of—during the present summer season.

Sixty-three per cent of the household mechanical refrigerators covered by the survey are five years old or older. Since the OCR calls its survey "geographically and economically representative of the nation as a whole," it is believed that this figure on the age of refrigerators might hold good for the whole country.

The survey revealed that radios stand out as the item most in need of repair, with vacuum cleaners, washing machines, and electric cooking stoves high on the list.

Of radios owned in the homes surveyed, 85% were reported in working order, but 28% of the householders with radios stated that they have needed some sort of repair since Jan. 1. Slightly more than half of these reported that they had no difficulty obtaining repairs. Eight per cent of households owning one or more radios say that they have none in working order. More than 50% of the radios in use were shown to be five or more years old.

Of the 16% of the owners who have tried to obtain washing machine repairs since Jan. 1, more than two-thirds have been successful, according to the survey. Ninety-five per cent of these washers are in working order, although 72% of them are five or more years old.

## 110 Schools Training 4,800 Repairmen

CLEVELAND — Some 110 local schools have been placed in operation and more than 4,800 students have been enrolled in the National Refrigeration Service Manpower Training Program, sponsored by the National Refrigeration Service Council, reports W. Ray Kromer, national training director.

There are several more cities in which Local Service Councils have been formed with plans still under way for the inauguration of a school, Mr. Kromer said.

The training program, designed to meet the problem of the shortage of refrigeration repairmen who service the nation's highly vital refrigeration installations, has been given active cooperation by the War Manpower Commission and the U. S. Department of Education.

However, the initiative for forming schools must be taken by local groups of dealers and service contractors, who form Local Service Councils along the lines of a plan issued in booklet form by the National Refrigeration Service Council, and obtain local classroom facilities to get a school started. They must enlist the students and provide instructors from their own ranks.

Need for more refrigeration repairmen is still asserting itself, declares Mr. Kromer, and it is likely that the program may be given further impetus this fall.

## Advisory Group Seeks Okay for L-38 Revision

Changes Called Aid To Producers; Display Case Production Debated

WASHINGTON, D. C.—A proposed revision of Limitation Order L-38, covering industrial and commercial refrigerating and air conditioning machinery and equipment, was discussed at recent meetings of the General Refrigeration and Air Conditioning and the Commercial Refrigeration Industry Advisory Committee, WPB announced July 22.

Both groups agreed that the revision of the order should be made because it will provide a more flexible framework within which manufacturers may operate.

The Commercial Refrigeration Committee discussed a proposed program for the manufacture of a limited number of display cases. It was agreed that any such program should be adopted only if sheet steel for such cases is available and if the production would not divert manpower from war work.

Both Committees received preliminary reports on the Bureau of Census survey of 1940 operations of refrigerating and air conditioning industries. Final reports are expected to be available early in August.

The General Refrigeration and Air Conditioning Committee discussed preliminary reports which are being prepared on various parts of the industry's operation. Final reports from various Committees are expected to be submitted to WPB between Aug. 5 and 10.

The Committee also discussed the current "Freon" situation. It was pointed out that the new "Freon" producing plant which is being constructed in Chicago is expected to go into operation Aug. 15. It was further pointed out that it will be some time after the plant goes into production before it will be possible to build "Freon" inventories to a point where there will be relief from the general shortage.

## Boyd Bullock Back As G-E Adv. Mgr.

BRIDGEPORT, Conn.—Lieut. Col. Boyd Bullock has returned from Army service to take over his prewar position as advertising manager of General Electric's appliance and merchandise department.

He entered active Army service Feb. 12, 1942, as a major. At that time he reported at the Infantry School, Ft. Benning, Ga., where he attended the Battalion Commanders & Staff Officers Refresher course.

(Concluded on Page 36, Column 1)

## Town Plans Freezer Firm To Employ War Vets

SKANEATELES, N. Y.—To provide jobs for returning servicemen after the war, residents of this community are planning to establish an assembly plant for home freezers and vacuum cleaners which will be augmented by a large sales force, according to Charles T. Major, attorney and president of the local Chamber of Commerce.

"We have not wasted any paper printing a prospectus or painting word pictures," declared Mr. Major. "The proposal is well rooted and we are certain of ample financial backing"

(Concluded on Page 36, Column 3)



## WPB's Reconversion Pattern For Washer Industry Gives Some Chance To 'Newcomer'

(Concluded from Page 1, Column 3)

it would be impossible for a highly organized mass production industry to go ahead until its suppliers were in a position to provide a balanced flow of the ingredients of production."

It was brought out very clearly in the meeting how essential the washing machine is as a labor saver, especially among the families of war workers. Members were told that the washing machine is up among the first half dozen items indicated by various surveys as being most needed by consumers.

Manufacturers were urged to check every opportunity to determine when—through changing conditions in their own plants and in the plants of their suppliers—even a limited number of washers could be made ahead of the fall of Germany, that is, ahead of general reconversion.

Committee members said that the present status of their war contracts indicates that some production could be had 90 days after materials, components, and manpower could be assured to them. These estimates were based on the present position of their munitions contracts. It was evident, however, that considerable uncertainty exists about these contracts—they might be either increased or decreased in the uncertain period immediately ahead.

Mr. Boulware pointed out that the time when each individual manufacturer may start must, of course, be

determined by WPB in the light of how the need and the opportunity for the activity coincide in each case.

"Everybody," he said, "would be happiest if all your plants and all those of your hundreds of components suppliers could be cleared at the same time and the industry resume production of washing machines simultaneously. But no matter how desirable this might be, it will most likely be found impossible because of the irregularity as to the time and amount of cutbacks in your own and your suppliers' plants."

Mr. Boulware ventured the personal opinion that the interval between the first and the last to resume civilian production in this and similar industries will not be long, although naturally it is impossible accurately to gauge the future.

"When we reach the point where this kind of activity can be authorized," he said, "conditions will most likely be so different from what they are now that I think the rapidity with which successive manufacturers will get under way will be surprising."

"We shall have so much in the way of available extra facilities created during the war that it certainly ought to be possible for the remaining munitions work to be shifted around and the way cleared to permit a reasonable rate of civilian production in each industry on top of the still required war production."

On the question of newcomers to

the industry, Mr. Boulware reminded members again on WPB's March 7 declaration of policy, which is to place no ban on them as such. He pointed out, however, that if critical materials and components are in short supply, and if a limited number of end products must be produced to meet urgent civilian needs, WPB would make a fair distribution of the limited supply but quoted Mr. Nelson as stating in the above declaration that this supply would not be shared with newcomers, "until firms already established . . . have received their just allocations."

If the established firms could not take their allocation by reason of war work or other causes, the newcomers could, of course, utilize the materials or components if the end-product or the activity is needed.

After a survey of the war contract situation with the manufacturers at the meeting, it was agreed that there is at present no possibility of general resumption and naturally there is also no date that can be settled upon even within wide limits as to when resumption can take place. It will depend first upon the course of the war, and second upon the cutbacks of individual military items in the individual plants of the washing machine makers and their suppliers.

Committee members were told that WPB is considering a proposal to relax restrictions on manufacturers' inventories of parts for domestic laundry equipment, and that this would increase materially the supply of parts for repair and replacement purposes. They also reported that provision had been made to apply an AA-1 rating to some of the more critical components.

## Package for Tubing - - When Materials are Available



As soon as packaging materials are available, Wolverine Tube Division of Calumet & Hecla Consolidated Copper Co. will market its refrigeration tubing in 50-foot coils of various size tubing in cartons such as the one shown here. John Marshall (right) manager of warehouse sales for Wolverine, points to labeling along the edges which will make the tubing easy to stock and identify on the jobber's shelves. This packaging idea is in line with suggestions made by the Manufacturers Relations Committee of the N.R.S.J.A.

## Wolverine Now Listing Its Tubing Prices On a 'Per Coil' Rather Than 'Per Pound' Basis

DETROIT—Prices on Wolverine copper tubing are now being listed on a "per coil" basis rather than a "per pound" basis, announces John A. Marshall, manager of warehouse sales and director of market research for the Wolverine Tube Division of Calumet & Hecla Consolidated Copper Co.

In another move aimed at making the handling of tubing sales more convenient for the refrigeration parts and supplies jobber, Wolverine has announced that as soon as packaging materials are available, tubing will be packaged in an individual carton designed to contain one 50-foot coil. These cartons will be shipped in a covering carton holding approximately 50 lbs. of tube.

These innovations in the merchandising of refrigeration tubing are being made by Wolverine Tube Division of Calumet & Hecla Consolidated Copper Co. following eight months of market research conducted in conjunction with AIR CONDITIONING & REFRIGERATION NEWS. It also is in line with some of the suggestions

made by the Manufacturers Relations Committee of the National Refrigeration Supply Jobbers Association.

In the new method of pricing tubing developed by Wolverine, the principal change is that the prices are listed "per coil" instead of "per pound" and on the refrigeration parts jobber's sheet the discount to him has been deducted and a net price per coil to the nearest cent is shown.

The revision in the price sheet reflects no increase in tube cost and has been approved by the Office of Price Administration.

Mr. Marshall declares that the new price sheet will help the parts jobber in (1) ordering, (2) reselling, (3) figuring out his invoices, and (4) costing his inventory.

Labeling that will give the size and length of the tubing in the package will be printed on the edges of the carton which Wolverine plans to use to package the 50-foot coil of tubing. For all but the larger sizes of tubing it will be possible to carry this carton under the arm.

## Prospects Better For Appliance Motors

(Concluded from Page 1, Column 2) dicated that military requirements for small motors were now at the top level and that with very few exceptions, will not require further production increases.

Many committee members agreed that the scarcity of fractional horsepower motors should not be regarded as an obstacle to resumption in the production of civilian appliances. It was pointed out that the same labor bottleneck that restricts motor production will restrict the production of civilian equipment. It was further explained that when the present manpower shortage eases, the small motor industry will find sufficient labor to meet requirements of the appliance industry.

Committee members also pointed out that specialized aircraft motors for the latest airplane models would continue to absorb facilities which could be used for resumption of the appliance program.

## CMP-5 Can Be Applied To Branch Activities

WASHINGTON, D. C.—Plants engaged in more than one activity may use the preference rating assigned under Controlled Materials Plan Regulation No. 5 to the principal part of their business to obtain Maintenance, Repair, and Operating Supplies for all their activities, the War Production Board pointed out in a recent announcement.

Plants that produce one item during an entire year and another for only a part of that year may follow this general rule, WPB officials said.

## Balderston To Head Philco Operations

PHILADELPHIA — Election of William Balderston, formerly vice president in charge of the commercial division, to the position of vice president in charge of operations, and a member of the Executive Committee of Philco Corp., has been announced by John Ballantyne, president.

Mr. Balderston joined Philco in 1930 to organize the Car Manufacturers Division to handle sales of automobile radios to the motor industry.

In 1941 Mr. Balderston was elected a director and vice president of Philco with offices in Washington to be in charge of the company's war work, including the production of radar and radio war equipment, for the Army and Navy.

## Frozen Food Processors To Get Price Support From Government

WASHINGTON, D. C. — Frozen food processors are to get government support prices on many of their products in a program similar to the one recently announced for canners. It was reported here last week.

Main point of the policy is to enable the freezing firms to produce at capacity without having to worry about inventory losses. A government-guaranteed price floor will be provided no matter what the open market may bring in the way of prices.

Vegetables likely to be included under the program are snap beans, golden corn, green peas, small lima beans, and spinach.

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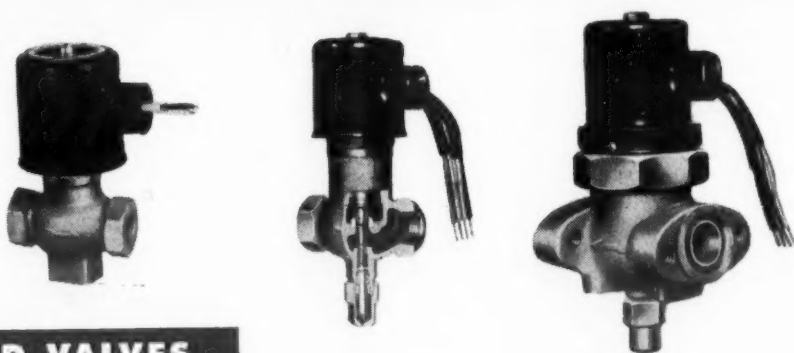
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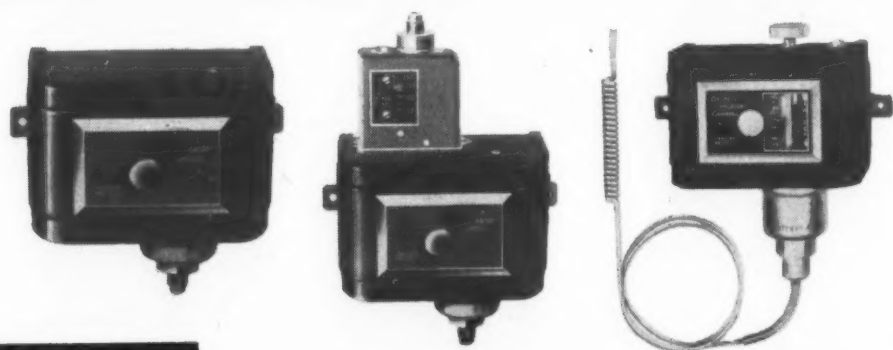
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# Lauer Reveals Many Odd But Vital Jobs Cooling Does For War Effort

YORK, Pa.—The importance of mechanical cooling to the war effort was given specific recognition in a talk recently made here by Stewart E. Lauer, president of York Corp., in which he detailed many of the specific uses of refrigeration on the fighting fronts.

After pointing out that every organization with facilities for providing technical components for war has had its opportunity to contribute something new, Mr. Lauer paid

tribute to the various government agencies' efforts in recognizing ingenuity and recommending improvement. Even a small plant with one manager, one technician, and 10 skilled mechanics, if aggressive, he said, has had equal opportunity with firms the size of General Motors or General Electric. The result has been thousands of technological advances which have not only helped to destroy the enemy, but more important, have helped to save many

American lives, Mr. Lauer said.

Mr. Lauer cited a number of examples of important technological advances involving mechanical cooling, maintaining that their development included elements of real romance. First, he described the problem of providing crosshairs for bombsights and gunsights. These must be perfectly round, he said, and must appear so under high magnification.

## PROTECTING SPIDER WEBS

Exhaustive exploration revealed Chinese hair as coming nearest to the requirements. However, when clearly magnified, it, too, showed too much distortion. In the end, spider web filament provided the solution, proving round under the greatest magnification. Getting all the filament needed then became a problem of providing a controlled atmosphere the year around in order to protect the delicate spider webs from deteriorating.

Only air conditioning, Mr. Lauer said, could and did create and maintain the atmospheric conditions required.

Mechanical cooling, Mr. Lauer continued, is doing an important job also in producing essential aids to life-saving in war. The production of penicillin, for example, is dependent in every step upon the most accurate control of temperature. Thus, without refrigeration and air conditioning there would be no penicillin.

Air conditioning provides and maintains exactly the temperature and humidity most favorable to the rapid growth of the mold in huge incubators. Here, the mold is grown in thousands of two-quart bottles on a liquid nutrient into which the mold secretes its golden droplets of precious penicillin. The liquid, decanted after a 10-day culture period, is then dehydrated by an intricate, highly exacting series of processes that involve freezing and evaporation under high vacuum.

After being tested for purity, blood samples are converted to blood plasma and centrifuged until the clear straw-colored plasma remains on top. The plasma is then frozen at -22° F. to -40° F. and subjected to vacuum treatment simultaneously until rendered absolutely moisture free. In this dry concentrated condition, it can be handled readily.

## BRINGING SKY TO EARTH

Mechanical cooling's contribution to the greater accuracy, safety, and supremacy of allied fighting equipment was outlined by the York executive, who said this country's determination to have supremacy in the air resulted in the development of low temperature test chambers of small, medium, and large volume capacity, capable of dropping to -110° F. These included altitude chambers for testing men and instruments under the unusual conditions likely to be encountered in various theaters of war; small testing cabinets for individual instruments with hair springs and the like where air temperature pressure control is of first importance, and a large tunnel with a hurricane blast, capable of containing a complete plane fuselage or any other apparatus that can enter a space 25 feet x 25 feet, for checking performance in high altitudes and correspondingly low temperatures.

Strato chambers that actually simulate flight are now in use to test men as well as engines, instruments and materials. Starting with an atmospheric pressure in the chamber and with the thermometer at 50°, men and materials can be made to undergo the same rate of change as though they were zooming up to 40,000 feet in a giant bomber—without leaving the earth. In 12 minutes the temperature has dropped to -67° F. and the pressure to less than 3 pounds per square inch. No longer is it necessary for pilots and scientists to risk their lives in making these tests the hard way. The strato chambers have brought the top of the sky to earth.

## ALASKA FOR THE ARTILLERY

Low temperature test chambers made it possible to experiment and develop substitutes for ordinary rubber, which for example, will snap like an egg shell in high altitudes.

In order to find out how big guns on planes act when firing in the stratosphere, a gun chamber was evolved in which a 75 mm. gun can be fired under stratosphere conditions. A twin-cell strato chamber

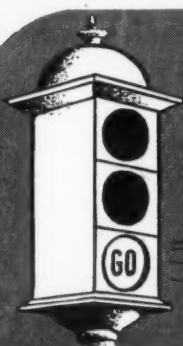
(Concluded on Page 5, Column 1)

# How Air Conditioning and Refrigeration Can Help Efficiency In War Product & Food Plants

Engineers at the East Springfield plant of Westinghouse Electric & Mfg. Co. have prepared this tabulation of modern industrial problems. It points out how air conditioning can improve the product (or operation) to make our war efforts more effective.

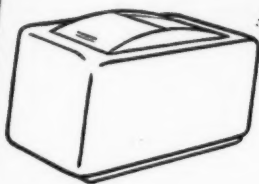
The process under consideration is given in the left-hand column; the problem to be solved by refrigeration or air conditioning is in the center column and the solution in the right-hand column.

Process	Problem	Solution
Machining Work	Too many rejects—cannot hold work within design tolerances—tools seizing and breaking—excessive coolant evaporation. Rash on workmen's hands.	Hold coolant temperature constant with automatically-controlled refrigeration.
Spectrographic Inspection	Erratic arc performance—distortion in spectrum photo—incorrect density values in spectrum lines, dust flecks on optics, deterioration of film.	Maintain proper conditions of temperature and humidity and remove air-borne dust with air conditioning.
Gauge Testing	Inconsistent performance of master gauge—cannot hold production gauge in proper calibration. Gauge and gauge block surfaces rust.	Hold temperature constant and keep relative humidity at reduced point, with air conditioning.
Electroplating and Anodizing	Cannot hold bath temperatures down to required limits—plating quality and thickness vary.	Remove heat from bath by circulating refrigerated water through coils in bath.
Optical Goods Grinding	Too frequent changes of pitch and lap setting required—lost time from skin rash—condensate on optics.	Hold temperature of room constant and filter out air-borne glass dust with air conditioning.
Optical Goods Assembly	Perspiration marks on optics—clouding between glasses—dust on optics—cement consistency varies.	Maintain relative humidity and room temperature at proper point with air conditioning.
Flying Suit Storage	Skins dry out and crack—mildew on furs and fabric—months feeding on fur and fabric.	Hold relative humidity at proper level and kill vermin with refrigeration.
Hobbing Large Gears	Too great variance in measurements of gear blank during cutting, due to wide room temperature variations—condensate on gear teeth and tools.	Hold room temperature constant and keep relative humidity low with air conditioning.
Instrument Assembly	Perspiration marks on highly polished surfaces—air-borne dirt on small assembly parts—condensation and corrosion on parts surfaces.	Hold temperature and relative humidity at correct levels and filter out air-borne dust with air conditioning.
Testing Solid Shot	Unable to detect faults and internal stresses in visual inspection.	Immerse shot in alternate hot and refrigerated baths to make defects visible.
Inspection Gauging	Too many rejects—gauges inconsistent—dust and condensation on finely-machined surfaces.	Control temperature and humidity and filter out dust with air conditioning.
Instruction in Link Trainers	High internal temperatures in Link Trainers make protracted training impossible. High temperature and relative humidity create perspiration hazard for controls and instruments.	Maintain room temperature and humidity at correct levels with air conditioning.
Citrus Fruit Concentration	Aging and spoilage of concentrate after canning.	Refrigerate concentrate storage room.
Parachute Storing	Mildew spots develop in 'chutes in storage. Too slow drying of 'chutes in drying room.	Maintain low humidity with air conditioning.
Food Produce Storage	Excessive spoilage. High humidity causing mildew or too low humidity drying out produce.	Hold proper storage temperature and humidity with refrigeration.
Spot Welding	Short life of welding tips. Too frequent cleaning of tips required—poor quality of weld.	Cool welding electrodes by circulating refrigerated water through special electrode holders.
Sandpaper Storage	Paper too dry, causing abrasive to become detached—paper too damp, causing deterioration.	Maintain humidity at proper level with air conditioning.
X-Ray Film Developing	Bath temperature too high. Lack of detail in developed films and inconsistent results.	Use controlled refrigeration to hold bath temperature at constant level.
Capsule Manufacture	Humidity detracting from quality and form of capsule.	Provide correct humidity with air conditioning.
Abrasive Wheel Manufacture	Binder compound consistency varies too much—batch weighing of abrasive ingredients not accurate. Drying time too variable.	Hold room temperature and humidity constant with air conditioning.
Packaging Dehydrated Foods	High relative humidity in packaging room causes too great moisture regain in dehydrated product.	Hold humidity at low point with air conditioning.
Airfield Traffic Control	Tower temperatures too high for proper working efficiency. Instruments and equipment affected by high temperature and humidity.	Reduce tower temperature to efficient operating level and hold correct humidity with air conditioning.
Industrial First Aid	Minor surgery rooms too warm—air-borne dust creates infection hazard—patients uncomfortable.	Reduce room temperature to proper level; filter out air-borne dust with air conditioning.
Instrument Storage	Too high or too low temperature and humidity affects efficiency and accuracy of delicate instruments.	Control temperature and humidity with air conditioning.



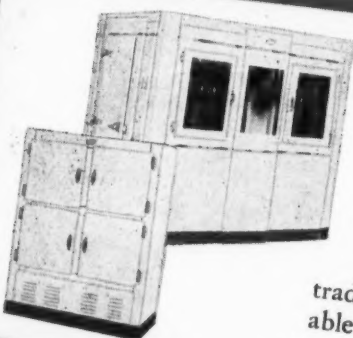
WHEN THE LIGHT CHANGES WILL YOU BE

ready?



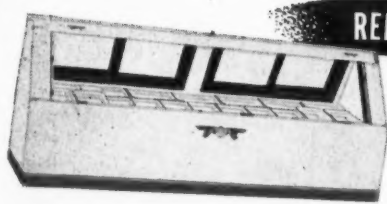
## BE READY—WITH SHERER FREEZERS

Juicy steaks, garden-fresh vegetables, fish, wild game and ice cream will be frozen in Sherer Freezers by thousands of Americans on farms, in stores and rural homes the country over. These freezers, available when restrictions are removed, such as self-serve vegetable and dairy cases, reach-in refrigerators and walk-in cooling rooms, as well as the Sherer distribution franchise, are available now! Write or wire for full details.



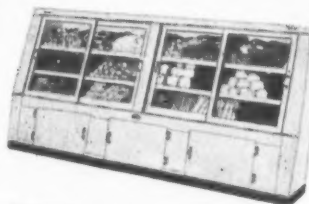
## AVAILABLE NOW!

Sherer reach-in refrigerators and walk-in cooling rooms have always been highly regarded by the trade, and extremely profitable for Sherer distributors.



## REFRIGERATOR DISPLAY CASES

As a pioneer manufacturer of fine commercial refrigeration, Sherer will offer meat, delicatessen and dairy display cases ranking with the finest, at prices that will bring you profits and volume.



## SELF-SERVE VEGETAIRE

Built for generous display and storage, the famous Sherer Vegetaire has for many years been a byword with food merchants as a "builder-upper" of extra fruit and vegetable sales and profits. You will find that Vegetaire sells in volume at a substantial profit to you.



Besides this complete line, Sherer's refrigeration accessory department offers you condensing units, fan and blower type coils, valves, controls and other supplies.

**SHERER-GILLETT CO.**

MARSHALL, MICHIGAN



## How Cooling Serves at War & Home Fronts

(Concluded from Page 4, Column 3)

was constructed to include the world's shortest firing range—22 feet long with a concrete backstop loaded with 20 tons of sand. For each maximum test, temperature is dropped from 70 above to -70° F. in 12 minutes while air pressure is reduced to a partial vacuum of 2.2 pounds per square inch. In the concussion chamber ahead into which the muzzle of the guns project, temperature is maintained at -67° F.

The importance of mechanical cooling to fighting craft, cargo ships, and landing craft was then reviewed. The United States is the only nation which provided the degree of safety and comfort represented by air conditioning in submarines, Mr. Lauer said. Air conditioning makes it possible for the steel fish to remain submerged for longer periods in avoiding the vigilance of enemy air patrols.

### ON AIRCRAFT CARRIERS

On aircraft carriers, air conditioning is installed in ready rooms, sick bays, control rooms, chart and plotting rooms, he reported, while refrigeration is provided for ship's stores, photographic laboratories, and for making ice cream, an important morale builder.

On battleships, refrigeration protects the powder magazines, prolonging the life of ammunition. Maintaining an even temperature for the powder results in more accurate firing of the Navy's guns, he said. Refrigeration cools water for development work in X-ray and photographic laboratories. Air conditioning is essential in the air-tight fire control rooms in charting and plotting rooms and sick bays. Air conditioning is the only answer to the high temperatures from hot machinery in steering gear rooms.

Mechanical cooling makes it possible to have standard liberty ships and large cargo carriers with a carrying capacity of 5,000 tons of frozen meat plying between Australia, via the Canal, to the British Isles, and over many other difficult routes, the speaker said. On landing craft, refrigeration is essential to ship's stores.

### COOLING IN THE JUNGLE

Mr. Lauer then told about the devastating effects of high humidity on delicate controls and instruments concerned with communications and similar important uses and explained how air conditioning virtually "brought the desert to the jungle" in protecting these units. Hundreds of tiny air conditioning units are at work today around the world, he said, providing small huts with a desert-like atmosphere, not for the comfort of man, but the protection of highly sensitive Signal Corps equipment.

As an example of air conditioning's contribution to safe and accurate production under blackout conditions, Mr. Lauer described a bomber plant in a sealed building .8 of a mile long and 1/4 of a mile wide. Here, conditioned air is not only essential to workers' well being, but actually, through comfort, greatly enhances their efficiency as well. With illumination, temperature, humidity and air movement controlled, day and night are indistinguishable, and the seasons become 12 months of springtime.

### PROTECTING RADIO DEVICES

The speaker then explained how the safety of the men and the accuracy of ship and plane communications rests on an air conditioning application. According to the speaker, radio tubes used on planes are replaced after each flight. Obviously this adds up to a need for greater quantities of tubes. Efficiency and economy of production are, therefore, of paramount importance. Control of air filtration, temperature, and relative humidity throughout plants manufacturing the tubes has virtually eliminated rejects and increased production 30% or more, the speaker said.

Another important application of mechanical cooling in manufacturing involves the synthetic rubber process, Mr. Lauer said. The production of butadiene, principal component of synthetic rubber, requires the maintenance of a constant temperature for

the polymerization process, in which butadiene and styrene are combined, forming buna latex. Also, a similar control of temperature is required in cooling rubber rollers used in one of the final steps of the manufacture of synthetic rubber. The speaker added that a special ammonia absorption type of refrigeration was found applicable to these processes.

In aiding in the recovery of a portion of the desired primary materials from vapors formed in the "cracking" process from original crude oil in the production of 100 octane gasoline, the refrigeration is a vital factor in from 75 to 80% of the total production of flying gasoline, the speaker said.

In feeding the world's best Army with the world's best food, mammoth 10-ton refrigerated trailer trucks bring fresh meats and other perishable foods to the troops wherever they may be. Such rolling refrigerators are made possible by a compact gasoline-driven refrigerating unit that can maintain a constant temperature as low as 10° F. even in tropical climates where the mercury may soar to 110° and roof temperature to 150°. Each unit operates automatically, and is entirely self-contained. Refrigeration also plays an important part, he added, in the processing of dehydrated foods and frozen foods used in the war.

### FAST ICEMAKERS FIND MANY USES

Refrigeration, through the manufacture of ice, contributes importantly to morale and is used freely in healing the sick and wounded, Mr. Lauer said. Decentralization, or the use of small self-contained units, instead of large single units represents the present practice, with the

"FlakIce" unit having a capacity of one ton of ribbon ice a day.

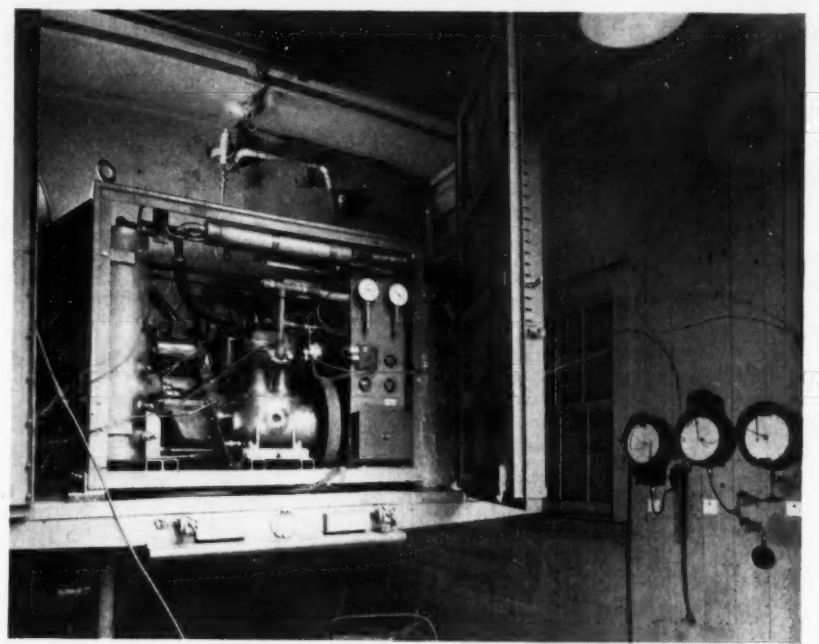
Of these units, 2,500 have been supplied foreign bases on Pacific islands, including some of the most remote spots in the area. When interviewed, Seabees and Marines equipped with these units have described them as their greatest morale builder. The speaker then told of the Seabees' various uses for flake ice, including its uses in the galley, for cooling water, fruit juices, and soft drinks and for making ice cream. He also said that the flake ice was more useful than trinkets, or even food, in winning the good will of the native population.

Members of the Medical Department of the Navy attached to construction units reported when interviewed that flake ice was used in advance base hospitals and mobile hospital units. They called the machines a "godsend," he said. The ice was used freely in ice bags or ice caps, applied to head or face wounds to relieve pain, prevent swelling and reduce fever.

Also it was used for refrigeration anesthesia, a comparatively new technique in surgery.

Members of the Photographic Section of the Bureau of Aeronautics recently returned from the Pacific area reported on the use of flake ice in keeping developing fluid temperatures to the 65° to 70° needed for obtaining the best results in aerial and record photography.

In conclusion Mr. Lauer made a convincing illustration of the technological advances made during the War. He cited the case of a power plant installed six years ago and up until the War period, considered quite modern. It contained six refrigeration units, each with a ca-



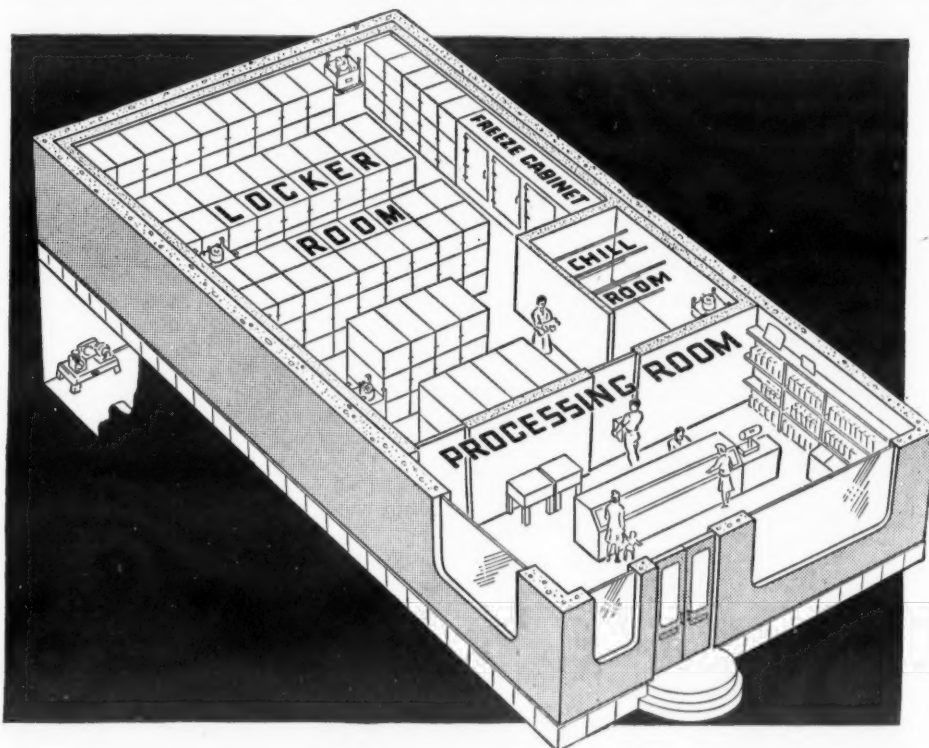
Criss-crossed by a maze of thermocouples, this new type Army refrigerated truck trailer, equipped with gasoline-driven refrigerating unit, is being tested for its resistance to a man-made "heat wave" created by engineers of York Corp. This is illustrative of the severe tests to which the industry puts products made for the Armed Services.

capacity equivalent to the melting of 800 tons of ice per day. He contrasted this with a power plant now being installed for one of the large chemical companies producing war materials in a secret process. This power plant will contain 10 refrigeration units, each with a capacity equivalent to the melting of 2,300 tons of ice per day, or a total of 23,000 tons.

Each refrigeration unit in the old power plant occupies twice the cubic

space, measured by length, width, and height, as the units in today's War plant, yet are capable of producing only one-third the refrigeration results. The units in the new War plant operate on the rotary principle, as compared with reciprocating principle in the prewar plant. They operate at about 20 times the speed. These new machines are built to absolute precision, statically and dynamically balanced, and utilize the finest alloy metals obtainable today.

## CARRIER offers Complete Service for LOCKER STORAGE PLANT OPERATORS



Today, the increase of locker storage plant facilities is an important factor in national wartime food distribution and storage.

Because the Government is encouraging this increase and public interest is growing rapidly, the locker storage plant offers a tremendous opportunity in the future, whether operated as a separate enterprise or in conjunction with another business such as cold storage warehouses, dairies, retail markets and general stores.

Carrier dependable storage plant equipment is a direct result of 12 years experience in this specialized field. Today Carrier locker storage system including equipment for chill rooms, processing rooms, freeze cabinets and locker rooms, are operating efficiently in many states from coast to coast. Capacities of refrigerating equipment range from 1/4 H.P. to 50 H.P. and complete system with

diffusers and evaporative condensers are available.

If you wish to cash in on the ever-growing demand for Carrier locker plant equipment, mail coupon below. Get complete information about the Carrier plan for contracting dealers. Learn how Carrier's engineering staff backs up each dealer; enables him to offer each customer full assistance in the establishment and successful operation of a sound growing business; assistance that includes every detail from plant layout to the setting up of a bookkeeping system.

Mail coupon for booklet of complete details today.



Carrier Corporation, Syracuse, N. Y.  
Please send information about the market for Carrier Locker Storage Refrigeration Systems.

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ATLANTA, GEORGIA, 348 Peachtree St. N.E.  
BOSTON, MASS., 1200 Staller Bldg.  
CHICAGO, ILLINOIS, 29 N. Wacker Drive  
CINCINNATI, OHIO, 1235 Carew Tower  
CLEVELAND, OHIO, 795 Union Commerce Bldg.  
DALLAS, TEXAS, 710 N. Harwood St.  
DENVER, COLO., 1718 California St.  
DETROIT, MICH., 542 Buhl Bldg.

LOS ANGELES, CAL., 1500 S. Santa Fe Ave.  
NEW ORLEANS, LA., 1026 Hibernia Bank Bldg.  
NEW YORK, N. Y., 405 Lexington Ave.  
PHILADELPHIA, PA., 12 South 12th St.  
SAN FRANCISCO, CAL., 625 Market St.  
ST. LOUIS, MO., 601 Ambassador Bldg.  
SEATTLE, WASH., 3421 Bella Vista Ave.  
SYRACUSE, N. Y., 300 S. Geddes St.

WASHINGTON, D. C., 934 Investment Bldg.

**Carrier**  
AIR CONDITIONING • REFRIGERATION



## Kay-Stern Co. Formed To Distribute Admiral

PITTSBURGH—A new firm under the name of Kay-Stern Distributing Co. has been formed to handle Admiral products in Pittsburgh.

The company will occupy an eight story building at 808 Penn Ave. This building will have a show room equipped to display Admiral Products when they are available.

Harold Kay, one of the partners, has been general sales manager of Hamburg Brothers, Pittsburgh, for the past 13 years. Norbert Stern is head of the International Finance Co. with headquarters in Pittsburgh.

## WANTED:

### Man to Head up RESEARCH on Design and Marketing For New Line of Electric Refrigerators

• We want a top-notch man . . . experienced in the field of electrical refrigeration . . . a man who is not afraid of new ideas . . . a man who knows not only what makes refrigerators work, but also what makes them appeal to the customer.

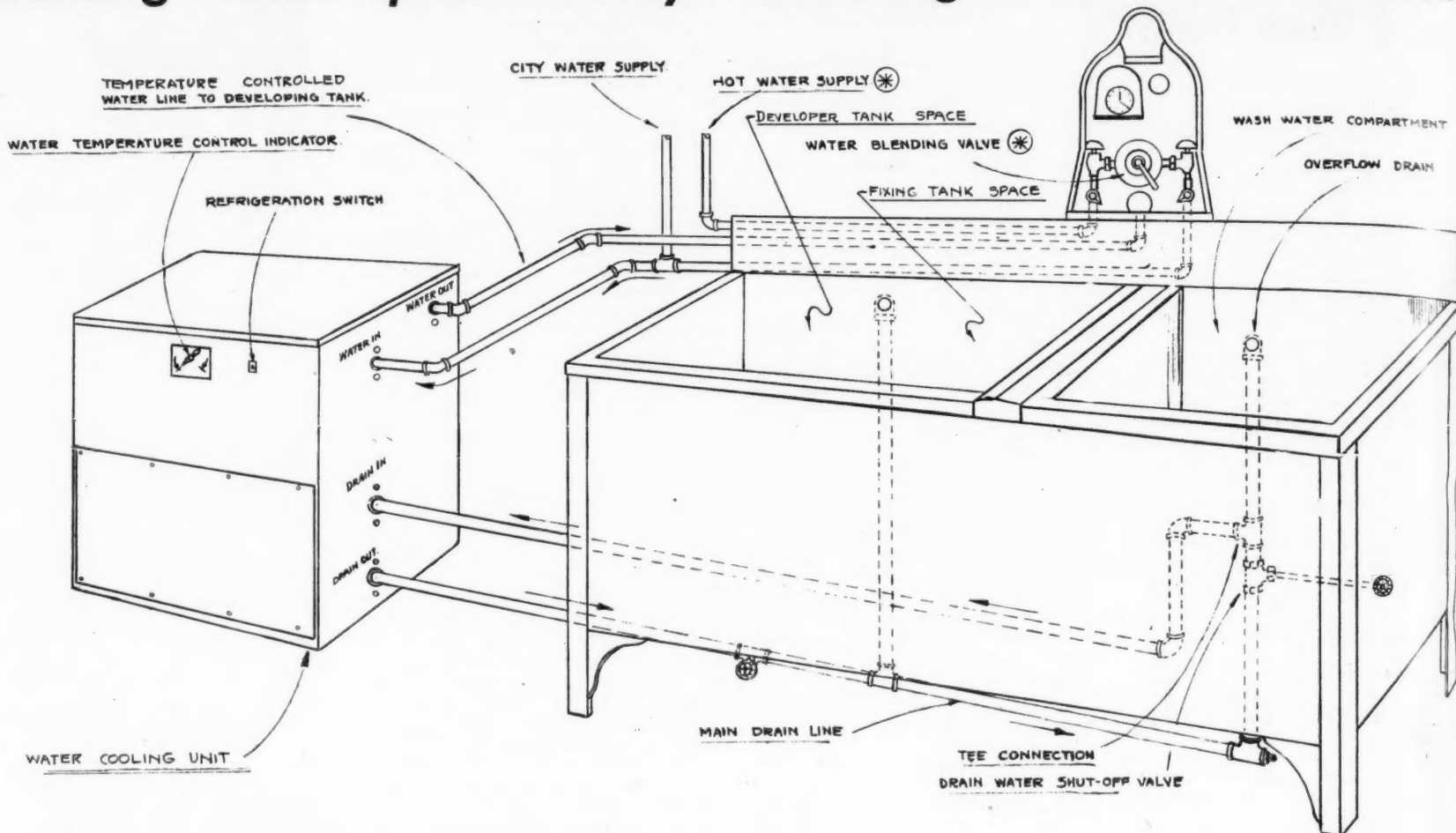
We are one of the nation's best-known manufacturers, with a well established distributing organization.

But we need a man right now to head up our RESEARCH on design and consumer preference which must be done to meet the post-war refrigerator demand.

Here's an opportunity to get in on the ground floor and ride up. Salary commensurate with experience and demonstrated ability. All replies absolutely confidential. Write, giving complete qualifications and experience in first letter.

Address Box 1596, Air Conditioning & Refrigeration News.

# Cooling Plants Speed X-Ray Processing at Induction Centers



⊗ FOR WINTER OPERATION

This schematic drawing shows a typical Temprite X-Ray developing tank installation. Chilled water is fed the wash tank and the jackets of the developer and fixing tanks, and when returned from the tanks is used to pre-cool incoming water. For winter operation a water blending valve combines hot and cold water to achieve the correct temperature.

## Controlled Water Temperatures End Delay In X-Ray Examination of Inductees

By James B. Smith

DETROIT—Precision development of x-ray films, which must last 20 years, has been accomplished at several Selective Service Induction Centers in various parts of the country through installation of mechanically cooled developing, fixing, and washing bath systems.

At the Detroit Induction Center, where up to 3,000 physical examinations have been conducted in 20-hour-day periods, use of cooled developer solution has reduced retakes of the

films to a negligible factor and has resulted in sharper and cleaner films than would otherwise have been possible.

The main problem involved in obtaining consistently good development of x-ray films is in holding developer, fixer, and wash bath at an even 68° F. temperature. When temperature of the developer rises above that point, a chemical fog which greys the entire film occurs and, in addition, speed of development increases, so that standard timing may result in too-dense a film for clear reading.

This is particularly objectionable in the case of the standard 4x10" films used at Induction Centers since both a front and back chest shot are carried on these films and utmost clarity is essential if an accurate reading is to be made from the individual 4x5" exposures.

Increases in temperature over 68° in the fixing bath frequently result in "crinkling" of the emulsion, and if the temperature rises above 80°, actual melting of the emulsion may occur.

Because the entire physical examination is geared to split-second timing, accurate temperature control is especially important in mass-production x-ray developments of the type used at Induction Centers. At the Detroit Center, the 6-minute developing bath is followed by a 10-minute fixing bath, a quick wash, and forced drying under a schedule which requires that the finished film reach the examining doctor just 20 minutes after the shot was taken. Spoilage of the film during processing, or an inconclusive print, would effect the entire examining line procedure.

In the typical center, refrigerated water is circulated first into the wash tank, then through fixing and developing bath jackets, after which it is used as a precooling medium for incoming raw water, and finally discarded.

## Calif. Air Base Gets New Cold Storage

HAMILTON FIELD, Calif.—Equipped with the latest type of refrigeration, a new cold storage plant has been constructed here. It has five large rooms for fruits and fresh vegetables and for freezing refrigerated meats, eggs, butter, and fats.

Room temperature of 35° F. keeps meat fresh as it arrives from the San Francisco Marketing Center while two chambers at the same temperature hold eggs, bacon, butter, and lard.

Temperature in the freezing room for beef and lamb is 10° F. A sharp freezer temperature of -20° F. prevails in another room where meats are held for a brief period.

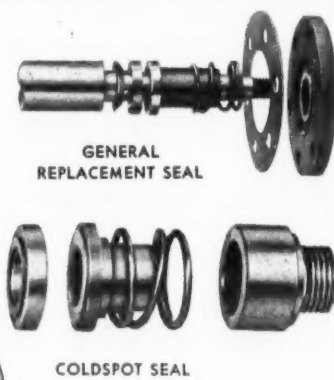
At the other end of the building is a large room heaped with fresh fruits and vegetables delivered to the base three times a week from San Francisco.

The new location has approximately 3,800 sq. ft. of floor space with 55 ft. frontage on Erie Blvd.

## Central Service Moves Its Syracuse Outlet

SYRACUSE, N. Y.—Central Service Supply Co., refrigeration parts jobber, has moved its Syracuse store to 516 Erie Blvd. E., in the heart of downtown Syracuse, announces Ted Glou, head of the firm which also operates a store in Scranton, Pa.

**The Heat's On!**  
LET  
**CHICAGO SEALS**  
make those hot jobs just a breeze!



More than ever, these summer days of 1944, "the heat is on" the men who must keep America's aging refrigerators efficiently on the job of preserving food and protecting health. The bright side of the emergency for many a service man is his discovery of CHICAGO SEALS. In spite of more calls, and less help, Chicago Seals enable him to do a better job, in less time, at a satisfactory profit. That's because the modern design of Chicago Seals makes for easier handling as well as for doing the job right. Even if a shaft is bent or scored, the Chicago Self-Adjusting Sleeve Lock makes a perfect seal. And in addition, the Chicago Seal gives triple protection against leakage. Use CHICAGO SEALS on your next job and see how smoothly you'll breeze through.

ASK YOUR JOBBER

for CHICAGO SEALS and VALVE PLATES

USE CHICAGO VALVE PLATES

They save time, work, and materials. Make it possible to replace only worn parts, not entire units. Sizes for most compressors.

**CHICAGO SEAL CO.** 20 N. WACKER DR., CHICAGO 6, ILL.

## SERVICE SIMPLIFIED GREATER SATISFACTION LONGER OPERATIVE LIFE



— a sure thing when  
**AMINCO**  
**OIL SEPARATORS**

protect Coils, Condensers, Compressors, Valves and Dehydrators by picking oil out of the refrigerant stream and AUTOMATICALLY returning this oil to its proper place, the crankcase.

Now that replacements are hard, almost impossible to get, those charged with the responsibility of maintaining existing equipment are looking for longer operative life and reduced operating costs.

Aminco Oil Separators protect compressors by maintaining correct oil level in crankcase and by excluding oil from refrigerant stream they enable coils, condensers, valves and dehydrators to function most efficiently.

These oil separators are made for jobs from 1/2 H.P. to 120 tons and are used everywhere, ashore or afloat, where efficient refrigeration is desired.

Full descriptive bulletins on request.

**AMERICAN INJECTOR CO.**

1481 Fourteenth Avenue

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George Boone, 739 G. M. Bldg., 1775 Broadway, New York 19, N. Y.  
William H. Cody, 2nd Unit, 10th Floor, Santa Fe Bldg., Dallas, Texas  
Export: Borg-Warner International Corp., 310 S. Michigan Ave., Chicago, Ill.

## NEW 1944 CATALOG



Write for copy on your letterhead

Wholesale Machine Parts Catalog will not be issued in 1944

**SERVICE PARTS CO.**  
2511 Lake St. Melrose Park, Ill.



# Inside Dope

By George F. Taubeneck

(Concluded from Page 1, Column 1)  
producing refrigeration and air conditioning items of special nature for use thereon.

It no longer is a secret that the cabin is pressurized and conditioned for the crew. Experience with early models demonstrated that on long trips such as the high-flying B-29 can take, crews suffered fatigue when they had to wear oxygen masks for hours.

So, the cabins now receive fresh air of proper consistency for good breathing and comfort right up until enemy fighter planes are sighted, or the area of anti-aircraft fire is reached.

Then the pressure is turned off and the men don oxygen masks, because shell holes in the cabin, of course, would nullify the system. But in the meantime the men will have arrived over the target fresh, and in good mental and physical shape to do their jobs.

They will also carry the new aluminum-shell, extra-light-weight refrigerators now being worked on so feverishly, so that they can eat something better than K-rations while on their very long trips.

## Frigidaire & the B-29

It was a challenge to Frigidaire engineers and fellow production experts when they undertook to make the giant four-bladed Hamilton-Standard propellers, the largest now used on airplanes, for the B-29 Super-Fortress.

A single one of these propellers weighs more than one third of a ton—yet so delicately must it be balanced that the weight of a fly on the tip of one of the blades is sufficient to upset the balance.

Far from being the simple hub with four blades which it appears to be at a casual glance, a four-bladed propeller is actually one of the most complex of mechanisms. It is made up of more than 1,700 separate parts.

These parts must fit together even more precisely than in the three-bladed propellers which Frigidaire has been producing for the past two years for Liberator bombers, Flying Fortresses, and other planes.

The longer, heavier blades of the four-bladed propellers would dangerously magnify any excessive slack or play in their assembly.

The problems faced in manufacturing these huge 4-bladed propellers are illustrated by comparing them with a typical refrigerator com-

pressor motor. Five of the most difficult parts to manufacture for the refrigerator mechanism have 160 dimensions which must be held in close relation with each other. A like number of propeller parts have almost 1,100 dimensions which must be held to even closer tolerances, or seven times as many as on the refrigerator mechanism.

## Back With Carrier

Hugh S. Martin, widely known in the business, has been honorably discharged from the Army, and is now with Carrier Corp., doing special research on the freezing of foods in Carrier's Development Department.

He closed his business (Martin Engineering Co. of Toledo, Ohio, Carrier distributor in that area), to enter the Army Air Force, where he became Flight Instructor for the 69th Army Air Force Flight Training Detachment.

He was stationed at Fletcher Field, Miss.; Kelly Field, Tex.; Ellington Field, Tex.; and Grider Field, Ark., during his tour of duty. At these flying fields he trained many young pilots who are now in action in the various theatres of war.

Now that the Army has more pilots than it can conceivably use, Hugh has been released to go back to a task eminently useful in the troubled postwar world-to-come.

## Electric Power

When you learn that the battleship "New Jersey" has a power plant aboard which will supply five times as much electric current as is consumed by the city of Albany, N. Y., you get an idea of why additional electrical power-producing capacity is being installed currently.

Last year 1,400,000 kw. was added to the supply; this year the gain will be only half that much. There is now more electric power plant aboard U. S. Navy vessels than exists in all the public utility installations on land in the whole nation!

## Export Statistics

Export trade statistics from now on should become more accurate. Foreign Trade Division of the Census Bureau has just published its 1944 revision of Schedule B, the classification of export commodities, which every exporter must use in preparing his "Shipper's Export Declaration."

Number of commodities listed in Schedule B has been increased from 1,400 to 56,000, set forth in a 259-page volume. With this new classification set-up, an exporter now should be able to designate accurately the item he is exporting—something he has not always been able to do in the past. Thus the export statistics of the future should be much less misleading.

Schedule B is published in two parts: Part I, an alphabetical listing of export commodities for use of the exporter; Part II, articles listed by groups, for the user of foreign-trade data in interpreting and analyzing their meaning. Commodities in both parts are printed in capital letters, and are hard to read.

Price of Part I is 75 cents; Part II, 65 cents, obtainable from the Superintendent of Documents, Washington 25, D. C.

## Incentive Plans

Wage incentive plans are accounting for an average increase in productive performance of 25 to 40% in regions where they have been adopted, according to John W. Nickerson, director of the War Production Board's management consultant division.

Ninety-five percent of the plans indicate gains of over 5%, and some run from 100 to 150% in specific installations.

Nickerson declares that the special type of incentive plan which is applied to the individual worker and is based upon time studies results in increases in productivity averaging over 60%. Other types of plans—those based on past performance and those applying to departments and whole plants—are producing increases averaging some 30%.

## Dehydration

Although G.I. experience with dehydrated foods has dampened early enthusiasm for the future of domestic dehydrators, some business men are not overlooking the extended possibilities of commercial food dehydration.

Take cattle feed, for example. In attempts to find substitutes for oh-so-scarce corn, dehydrating plants have been working with sweet potatoes and peanut hay. The results—especially with peanut hay—are most promising. Vitamins and proteins, which are damaged by sun-curing, are preserved in dehydration.

You can expect the South, which has a growing cattle population but is a poor corn-growing region, to be immensely interested.

## Tax Incentive Plans

One political factor which may have its effect on postwar taxation is the likelihood that great numbers of vote-potent returning soldiers and sailors will want to go into business for themselves. You can bet that Congress will try to set up means of helping them.

Some believe that substantial tax exemptions will be granted to all small businesses; others think such exemptions will be granted only to those organized after the war. They say that this will make commercial credits much easier to obtain for these little businesses, and that that would be a healthier situation than for the government to do the lending.

But big business or little, a great area of agreement is found amongst tax planners on proposals to grant special tax exemptions to those who increase employment over a specific prewar base.

It is also proposed that idle savings be progressively taxed, in order to force private capital out into new productive enterprises. This sounds impossible to us, but then so did a lot of other things which have happened in the last 11 years. One almost-sure reform everyone would welcome: repeal of the capital stock and declared value taxes. This may come along with repeal of the excess profits tax.

It should not be overlooked that one classification of "small business" is likely to look most attractive to returned service men: shopkeeping.

Also it wouldn't be surprising if great numbers of the mechanics trained by the armed services should want to open service shops.

No patriotic American will say them nay, but it is one factor which both those who are now dealers and all those who say they want to be should be ready to consider.

AMCOIL FOOD CONDITIONER

## NEW COOLING-PLUS UNIT

Adds High, Controlled Humidity

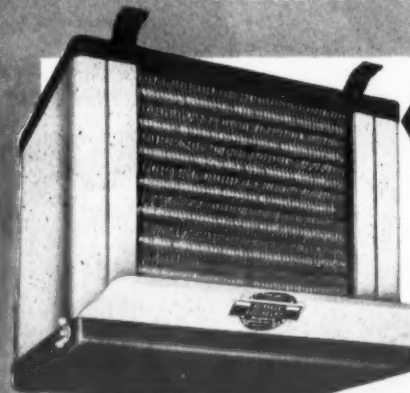
Amcoil Headliner Steps Up Your Sales



Here's something new, different—a practical combination of high, controlled humidities with cool temperatures in a good preserving unit with great commercial possibilities. The recently-announced Food Conditioner spearheads a line of Amcoil-engineered products designed and built to advance refrigeration standards and make sales history.

More than a unit cooler, it combines Cooling Temperatures of 35° to 40° F. and high, controlled humidities up to 85%. Built to be used in Walk-In Boxes. The double job done by this compact packaged refrigeration system preserves and saves foods without dehydration. It's engineered to protect stored fresh meats, fruits and vegetables, perishable foods, butter and cheese, eggs, flowers, bakers' and confectioners' products—and to retard dough.

THESE TWO COMPANION ITEMS ROUND OUT THE PICTURE OF OPPORTUNITY NOW



AMCOIL ALSERVICE OPEN-FACE COOLING UNIT, a standard type forced draft cooling unit. Modern streamline design and in attractive colors, grey and black, it produces temperatures down to 34° F.

AMCOIL ALSERVICE DOWN DRAFT COOLING UNIT, a new type of cooling unit employing some new principles of refrigeration developed by Amcoil Engineers. Convertible to Food Conditioner unit by addition of parts if need for humidity control arises in the future. Temperatures down to 34° F.



As replacement equipment on rated orders of AA5 or better under L-38, these Amcoil units can be delivered now. WPB Task Committee figures indicate that 1944 sales of commercial refrigeration equipment for replacement will exceed \$100,000,000 in retail sales value. Get your share of this business with Amcoil-engineered units, embodying the combined technical skill and experience gained in the making of cabinets for testing war products under varying humidities and temperatures from -100° to +160° F.



AMERICAN COILS CO.

25-27 LEXINGTON STREET - NEWARK, N. J.

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**BEN-HUR FARM LOCKER PLANTS**



# WHAT IT TAKES To Be A Refrigerator Repairman

Office of Civilian Requirements Makes a Study  
And Discovers the High Skill Needed In Such Work

Prepared by The WPB Office of Civilian Requirements  
Philadelphia Regional Office  
In Cooperation with  
The Electrical Association of Philadelphia

(Editor's Note: "Refrigerator repairman" is one of the "critical occupations" listed on WMC's tabulation of essential activity. This study by a government agency shows why the occupation of a "refrigerator repairman" is so necessary and so critical in these times).

(Continued from the July 17  
issue of the NEWS)

Refrigeration has become an almost indispensable part of the average person's daily life. Any interruption in the normal service rendered by the refrigeration system is keenly felt by the person involved—it may be in a private home or a commercial installation.

Answers to all of these 120 questions must be learned by the service man if he is to be able to diagnose trouble and carry on with his job. This is on domestic refrigeration only.

1. What is the function of mechanical refrigeration?  
2. Describe the direction of heat flow.

3. Why is refrigerator cabinet insulation necessary?
4. What is the purpose of a compressor?
5. Why is a condenser necessary in a refrigeration system?
6. What is the function of a liquid control valve?
7. Name the two dividing points between the high and low sides of a system.
8. What is the function of the cooling unit?
9. By what process is the condensing unit stopped when the food compartment is cold enough?
10. How should a service man work, talk and act in a customer's home?
11. What is latent heat?
12. Give the definition of heat.
13. What is a B. T. U.?

14. Name the three basic methods of heat transfer.
15. State the boiling points of Sulphur Dioxide, Methyl Chloride and "Freon-12" at atmospheric pressure.
16. Assuming a 90° room temperature and 28 lb. suction pressure give the head pressure for a Methyl Chloride Air Cooled Condensing Unit.
17. What is the purpose of liquid control?
18. How is lubrication accomplished in a refrigerating system?
19. What are the functions of a temperature control?
20. Explain the benefits derived from a heat exchanger.
21. Name the component parts of a refrigerating system.
22. What is specific heat?
23. Describe briefly one complete cycle of the compressor.
24. Name the internal moving parts of a reciprocating compressor.
25. What is the function of a crankshaft seal?
26. What is the compressor dividing point between the high and low side of a system? Why?
27. Describe the method most commonly used to lubricate the moving parts of a compressor.
28. Give one indication of an inefficient compressor.
29. How is a test compressor efficiency on the low side of the system carried out?
30. Describe the procedure for checking compressor efficiency on the high side of the system.
31. When should a shaft seal be changed?
32. When should valve reeds or valve plate be changed?
33. What are the boiling points of Sulphur Dioxide, Methyl Chloride and "Freon-12"?

34. What would be the gauge pressure on a refrigerant drum containing "Freon-12" in an 80° F. room temperature?
35. What are the general characteristics of "Freon-12"?
36. How is it possible to make a refrigerant boil without raising its temperature? Why?
37. What are the most common methods of testing for leaks? Sulphur Dioxide, Methyl Chloride, and "Freon-12"?
38. What effect does air or other impurities have on the condensing pressure of a condensing unit?
39. How can the type of refrigerant in a system be determined if it is not indicated on the name plate?
40. What type of refrigerant dryer can safely be used with the common refrigerants?
41. What is meant by saturated vapor? By superheated vapor?
42. What is "clearance volume" and re-expansion in a compressor?
43. Name five of the principal things that may prevent a refrigeration system from developing its rated capacity.
44. What are the sources of excessive moisture in a refrigeration system and can its entrance be prevented?
45. What is the process of condensation?
46. Describe the useful purpose served by a condenser.
47. How is rapid air change at the condenser accomplished?
48. Why is it necessary to create an air change at the condenser?
49. Name three things, in connection with the condenser, that can cause high head pressure.
50. Describe the procedure for purging air from a condenser.
51. What is the purpose of a liquid receiver?
52. When the liquid receiver outlet is at the top of the receiver, why is an inner liquid tube necessary?
53. Describe the operation of a high side float type receiver.
54. How is air purged from a liquid receiver?
55. What is the purpose of low side float valve? Where is the float ball located?
56. Describe the refrigerant cycle of a low side float valve system.
57. What are the visible symptoms of a clogged strainer?
58. Name three conditions that may cause low side float trouble.
59. Describe the function of a high side float valve.
60. Is it practical to operate more than one cooling unit with a common high side float to control the refrigerant flow?
61. Why is the refrigerant charge critical in a high side float valve flooded system?
62. Give one visible indication of an inadequate refrigerant charge. Of a slight overcharge.
63. How do you remove air or non-condensable gas from a refrigeration system?

## Can You Answer the 120 Questions?

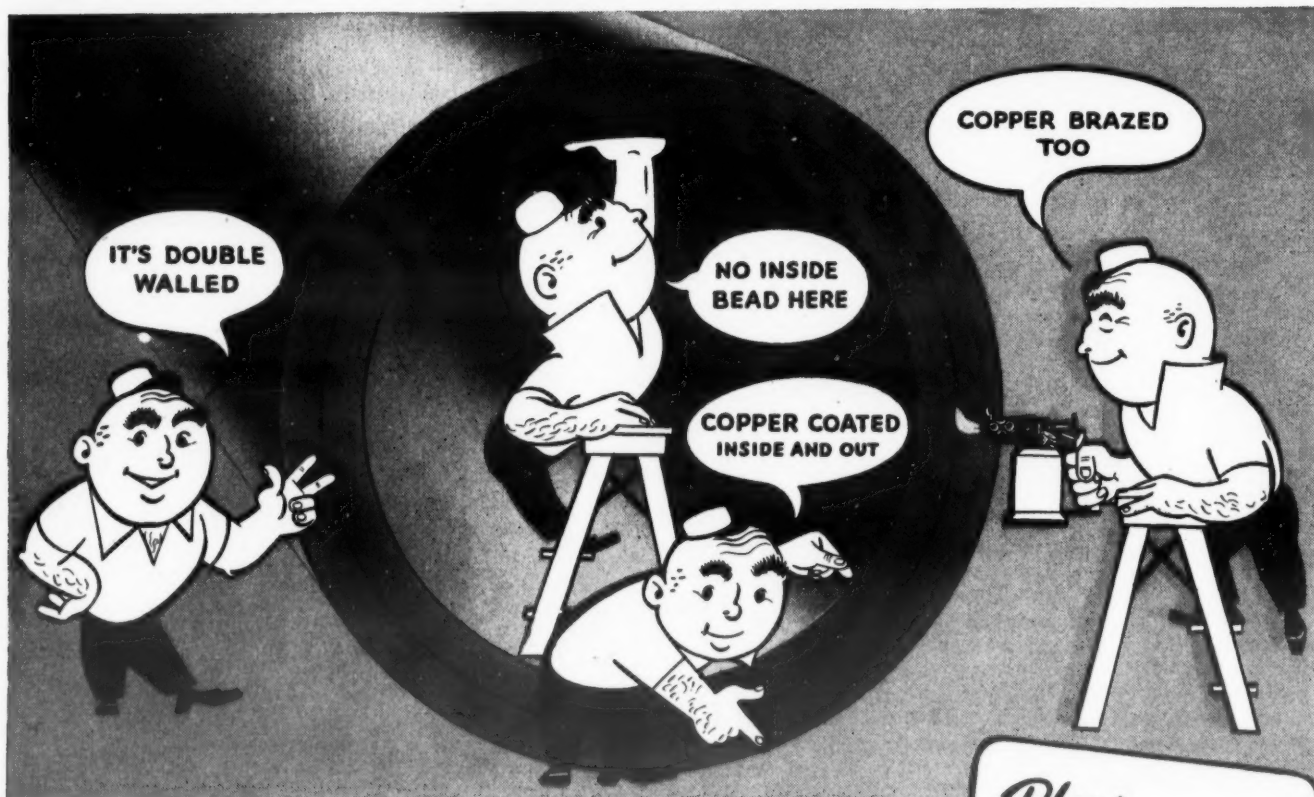
On this and the following pages are 120 questions to which a refrigerator repairman should have the answers if he is to qualify as an expert on servicing household mechanical refrigerators. If you are interested in refrigerator repairing, give yourself a quiz on these and see how close you come to being an "expert."

64. What are the two general types of expansion valves and what is the main difference between the types?
65. Explain how an automatic expansion valve operates.
66. Explain how a thermostatic expansion valve operates.
67. Where should an automatic expansion valve be installed?
68. Where and how should a thermostatic expansion valve be installed?
69. Explain how an automatic expansion valve should be adjusted.
70. Explain how a thermostatic valve should be adjusted.
71. What are the symptoms of a leaky automatic expansion valve and how do you test for it?
72. What is the corrective procedure for a leaky expansion valve?
73. What are the symptoms and corrections for a dirty expansion valve strainer?
74. What are the two purposes of a temperature control?
75. With what substances are thermostatic control power elements usually charged?
76. Is a pressure control subjected to the pressures on the high side or low side of a system?
77. What part of a thermostatic control is known as the "power element"?
78. How can a replaceable-type power element bellows be checked for lost charge?
79. What are the results of operating with a loosely clamped control bulb?
80. Name three things that are often mistaken for control trouble.
81. Describe control range; differential.
82. Why is it necessary to use a thermostatic type control on a system equipped with an automatic expansion valve?
83. What type of control is used with sealed systems? Does it operate directly or indirectly to start the motor?
84. The recommended setting is 25 to 27 pounds cut-in and 17 to 19 pounds cut-out on a pressure control. What is the compensated setting for an altitude of 5000 feet?
85. What four types of fractional horsepower motors have generally been used to drive open type refrigeration systems?
86. What installation conditions which may be remedied on the job may produce low voltage?
87. What are the normal limits of allowable voltage variation?
88. How fast is a compressor running which is belt driven by a 1/2 horsepower 60 cycle, AC motor using a 3" motor pulley and driving a 10" compressor pulley?
89. What may cause a motor to be overloaded?
90. What are the four common methods of motor overload protection?
91. How does an automatic reset work?
92. How should brushes fit in brush holders?
93. Should emery cloth be used to clean a commutator?
94. What two types of motor bearings have generally been used?
95. How do you reverse the direction of a repulsion-induction motor?

(Continued on Page 9, Column 1)

## Good On All Four Counts

# BUNDYWELD STEEL TUBING



## Unique, Exclusive Bundyweld Provides Superior Construction

Depend on Bundyweld, for superior strength and resistance to vibration fatigue. This solid double-walled steel tubing, laterally rolled from a single copper-coated S.A.E. 1010 steel strip and completely copper brazed throughout the entire 360° of wall contact, assures the utmost in ductility, cleanliness and uniform wall thickness.

Bundyweld is furnished hard or annealed in a wide range of standard diameters and gauges up to 5/8" O. D. Special sizes, cold drawn as desired. Also furnished in Monel. Write us direct for further data in connection with your war or peacetime tubing problems. Bundy Engineers will be glad to assist you. Bundy Tubing Company, Detroit 13.

## "FAMOUS LIFE LINES" FOR WAR AND PEACE BUNDY TUBING



BUNDY TUBING DISTRIBUTORS AND REPRESENTATIVES:

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3100 19th Street  
San Francisco 10, California

Standard Tube Sales Corp.  
1 Admiral Avenue  
Maspeth, New York City, N. Y.

Lapham-Hickey Company  
3333 W. 47th Place  
Chicago 32, Illinois

Rutan & Company  
112 South 16th Street  
Philadelphia 2, Pennsylvania

Eagle Metals Company  
3628 East Marginal Way  
Seattle 4, Washington

## Plus FAMOUS BUNDY DOUBLE FLARE



2



- Leak - proof, pressure - proof joints
- Safely permits over-torquing

## Gilmer BELTS

Keep your eye on present-day air conditioning and refrigeration equipment. Their importance to vital war production is building sales for alert men.

Naturally, a good supply of Gilmer Belts will have you ready to meet any belt emergency. Rugged, long-lived, and efficient, Gilmers are built to stand the gaff and do a topnotch job. Get in touch with a Gilmer jobber, and be ready for more business.

L. H. GILMER COMPANY  
Tacony, Philadelphia 35, Pa.



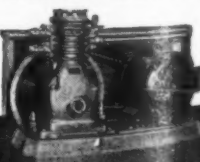
## FOOD MUST BE

## CONSERVED

Refrigeration today is performing a vital service by guarding and preserving for future use, priceless food which might otherwise be wasted. Write for literature.

GENERAL REFRIGERATION DIVISION

Yates-  
American  
Machine Co.  
Beloit, Wis.



Lipman  
AUTOMATIC REFRIGERATION



## Survey Reveals Wide Range of Knowledge Needed To Repair Refrigeration Systems

(Continued from Page 8, Column 5)

96. Where should one look first for failure if a belt tightener, capacitor type motor becomes inoperative.
  97. What are the two general classifications of household refrigeration?
  98. Outline briefly the necessary steps for installation of a self-contained refrigerator.
  99. Describe the proper method of adjusting and aligning a belt.
  100. Briefly explain the method of leak detection with SO<sub>2</sub>. With "Freon-12" and Methyl Chloride.
  101. What extra precaution should be taken in moist or humid weather when drawing a vacuum?
  102. Give one cause of high condenser pressure.
  103. Give one cause of low condenser pressure.
  104. Describe an ideal location for a remote condensing unit.
  105. Name five things to remember when running tubing for a remote installation.
  106. How do you prepare a refrigerator with an open type unit for storage and shipment? A sealed unit?
  107. How can the type of refrigerant in a system be determined if it is not indicated on the name plate.
  108. Give two indications of refrigerant shortage in a sealed system.
  109. To what extent can a sealed unit be serviced?
  110. Describe the refrigerant cycle in a sealed system equipped with a small diameter liquid line instead of a float valve or expansion valve.
  111. What benefits are obtained from the use of a heat exchanger?
  112. Name two methods of condenser cooling.
  113. List three necessary articles of test equipment, used for electrically testing sealed systems.
  114. Name three possible causes of noise in a sealed unit.
  115. Is the greatest heat load in the average refrigerator created by leakage or by stored provisions?
  116. Why is it necessary to keep insulation absolutely dry? What precautions are usually taken?
  117. Name one cause of air leakage around a food compartment door.
  118. Why is it necessary to defrost a cooling unit? What should be the maximum thickness of frost before defrosting?
  119. What conditions will cause frost to form more rapidly than normal?
  120. What is the most commonly used refrigerator exterior finish today?
- The following comment is made by John McCauley, 4-F, 22 years old, married, 1 child, at present is a trainee and on the J. J. Pocock, Inc., Philadelphia, payroll at the present time, training for the future. His comments while on the job at a commercial installation are interesting:
- "Has been with Pocock eight months—with previous experience with Hires Root Beer Co. delivering, servicing, and setting up water coolers.
- "Took the regular inside Primary Training Course and now spends each alternate day in the field with an experienced man.
- "Is not yet sufficiently familiar with the equipment to handle domestic service calls. However would be willing to 'take a crack' at a few.
- "Understands the principle and cycle of refrigeration only, but doesn't think could handle any serious complaint.
- "Expects to start out on routine inspection soon. (This means calling on users whose complaint is of minor character).
- "The large number of control valves are complicated—in fact confusing, as he thought could handle them O.K. in the schoolroom, but out in the field it is quite a big difference. Always 'gets stuck' and must call for help.
- "Is a mechanic by nature—likes to

tinker around—finds his new business very interesting. Wants to learn and is willing to pay the price in time but knows it will take him a long time.

"Expects to make refrigeration his lifework, as he sees a vast field of opportunity and a bright future."

### Type of Establishment In Which Refrigeration Is Used

Following is a list, by no means complete, of establishments and products men are called on to service:

#### FOOD STUFFS:

Fresh meats, cut.  
Fresh meat, carcass.  
Smoked meats.  
Fish and seafoods.  
Prepared meats.  
Poultry.

Eggs.  
Cheese.  
Fruits.  
Vegetables.  
Frozen foods.  
Banana storage and ripening.

#### FOOD PROCESSING PLANTS:

Meat chilling.  
Meat storage.  
Meat curing.  
Lard making.  
Sausage making.  
Locker storage plants.  
Manufacturing of certain condiments.  
Milk cooling (on farms)  
Milk cooling (pasteurized)  
Bakeries—dough mixing.  
Domestic refrigeration and refrigerators.  
Domestic or home freezing cabinets.

#### HOSPITALS:

All foodstuffs listed elsewhere.  
Ice storage rooms.  
Ice making.  
Water cooling, drinking.  
Water cooling, X-ray developing.  
Biologicals and serums.  
Laboratories.

Cadaver storage rooms.  
Body freezing.  
Mortuary refrigerators.  
Garbage storage rooms.  
Blood banks.  
Blood plasma.

#### INDUSTRIAL PLANTS:

Drinking water.  
Processing water.  
Processing brines (calcium, alcohol, etc.)  
Production of certain plastics (Flexiglass).  
Cloud and Pour tests of lubricating oils.  
Special laboratory refrigeration.  
Film storage (photographic)  
Cafeterias.  
Anodizing.  
MISCELLANEOUS:  
Florists.  
Fur storage.  
Rug storage.  
Bottling of carbonated beverages.  
Serving of carbonated beverages.  
Beer cooling.  
Candy making.  
Candy storage.  
Refrigerated trucks.

Ice cream making.  
Ice cream serving.

### Personal Qualifications

A serviceman must be sober, industrious, honest and trustworthy, as he is subject to be called upon at any hour, day or night, Sundays and holidays. He must have a good personality and be tactful as he is contacting customers of all colors, creeds, nationalities and temperaments.

Service men are taught to estimate, quote prices, do the work.

Please note that air conditioning, comfort and processing, has not been included in the above.

Each commercial installation is the same so far as the principle but the application is different.

The customer or large commercial installation management is not familiar with the reasons why the equipment breaks down. The request for service comes in, the mechanic goes out on a job, and from that point on he is on his own entirely. The work is done usually at home or at the in-

(Concluded on Page 10, Column 1)

## "FREON" TAKES "TIME" TO MERCHANDISE POSTWAR AIR CONDITIONING ...AND QUICK-FREEZERS



"This hotel has an air of its own, eh, Mrs. Cyzboskio?"



Another convention? Could be. But the popularity of this postwar hotel is no accident. It's a credit to the forethought of an owner who knew his guests would want the comforts of air conditioning.

People who travel have learned a lot about the benefits of air conditioning. And they like it. In days to come they'll prefer air conditioned trains, restaurants, clubs, theatres, stores, and hope someday to have it in their own homes, too.

In many war plants, workers are now getting a taste of air condition-

ing. It helps them do a better, more efficient job and takes the sting out of long hours and hard work. No longer is it a luxury. It's an asset.

Of course, today, "Freon" refrigerants have gone to war and are available only for essential requirements. But tomorrow—when the fighting is done—millions are going to expect air conditioning just about everywhere. And then "Freon" safe refrigerants will again be plentiful to help provide indoor climate control wherever it is wanted. Kinetic Chemicals, Inc., 10th & Market Sts., Wilmington, Del.



"Do have a helping of last year's spinach, Aunt Agatha"

last year's spinach, from garden?"

worry, Aunt Agatha. You taste this quick-frozen. It's as fresh as the day it more than a year

you've already experienced able-talk such as this. A today do have home and, you can't blame a little boastful about strawberries in August; spring round—and who isn't? everyone likes the idea of food at home. And

it's practical! So millions of families are eagerly looking toward the time when they'll be able to get a quick-freezing cabinet of their own.

Quick-freezers aren't being built today. Refrigerators and the "Freon" safe refrigerants that will be used in job protecting food for our fighting men on land and sea and in the air. But after Victory is won, "Freon" refrigerants will again be plentiful for the newer, better home quick-freezers that will become available. And they'll be well worth waiting for. Kinetic Chemicals, Inc., 10th & Market Sts., Wilmington, Delaware.

**FREON** safe refrigerants  
... used in most refrigerators and air conditioning systems



"Ooh, mamma... fresh air!"

break for Mother and Junior postwar shopping trip. No nerves. No fretting from a youngster. No headaches. Just the soothing of cool, clean, fresh air.

Thousands of owners have already learned about the sales value of air conditioning in their shops. To air conditioning is no longer a luxury. It's a business asset. And now customers regard it as a necessity.

For these people air conditioning will become a part of their

daily lives. They'll want to enjoy it in their favorite restaurants, hotels and theatres. They'll choose air conditioned trains. They'll realize that it would be fine to have indoor climate control in their own homes, too.

Today "Freon" refrigerants are helping win the war—they are available only for essential requirements. But tomorrow—after Victory is won—"Freon" safe refrigerants will again be plentiful. Then you will see air conditioning installed wherever it is wanted. Kinetic Chemicals, Inc., Tenth & Market Streets, Wilmington, Delaware.

**FREON** safe refrigerants  
... used in most refrigerators and air conditioning systems

THESE THREE "Freon" advertisements appeared in Time Magazine in June and July.

Each tells a story of interest to the public, business executives and to those directly concerned with air conditioning and quick-freezing installations. Read the messages yourself. While "Freon" safe refrigerants may be hard to get now because they've gone to war... soon they will be more plentiful to supply existing equipment. And after Victory is won there will be plenty of "Freon" for air conditioning systems, refrigeration and home quick-freezers. Kinetic Chemicals, Inc., Tenth and Market Streets, Wilmington, Delaware.

In the West it's  
**REFRIGERATION SERVICE INC.**  
Pacific Coast Supply Jobber  
since 1928  
Your letterhead will bring our latest  
catalog—also our House Organ,  
"The Liquid Line"  
3109 Beverly Blvd.  
LOS ANGELES 4, CALIF.

**FREON** safe refrigerants  
... used in most refrigerators and air conditioning systems

**KINETIC**  
**FREON**  
REG. U. S. PAT. OFF.  
safe refrigerants  
"FREON" IS KINETIC'S REGISTERED TRADE MARK FOR ITS FLUORINE REFRIGERANTS.



## Hospital Authorities Tell Why Prompt Refrigeration Repair Service Is Vital

(Concluded from Page 9, Column 5)  
stallation, each man is a shop of his own.

The refrigerant most generally used is "Freon-12," but because of restrictions listed in WPB order M-28 the material is not always available, and they must substitute Methyl Chloride which is not as satisfactory as to results, nor is it as desirable to handle, and another thing it is not allowed by the American Western Safety Code in Bulletin No. 15-B9-1939, so far as large installations are concerned, department stores, business assemblies, large institutions, hospitals, etc.

Each of these substitutions must be learned so that someone in the organization must be familiar with that particular installation as substitutions mean the changing of parts because of the pressure variance and this invariably means changing the speed of the compressor as each refrigerant has different pressure characteristics.

For this reason, certain men are assigned certain groups of units and they learn over a period of years because of actually working on this equipment the peculiar characteristics of certain installations—the man assigned needs supervision and study to acquire knowledge.

All parts of each installation must be known, therefore, service men are on constant call.

As an example, each commercial

mechanic is equipped with a gas mask which he carries with him all the time, and this mask must be used when handling sulphur dioxide. If there should be a fire the man may be called in the middle of the night by the Fire Department. In a private home the ice equipment could be left to burn or the whole ice box carried to the back yard, but this is not so easy at a large commercial installation where there would only be a few men familiar with the location of various valves controlling refrigerants, which would have to be turned off, otherwise the people fighting the fire would be jeopardized because of gas leaks.

Please understand that on every job the man is on his own.

We do know that pressure affects freezing temperatures. Say as an example that a soft drawn copper tube has broken. The service man is called up because the equipment stopped running or maybe is still running and the gas fumes are all over the place. He must first know exactly where to go to find the pipe that is broken. On discovering the break, which may take a new man two or three days, he must then know exactly how to solder or replace that particular length, so from this point on he must have a knowledge of a plumber or a pipefitter. The trick of learning how to sweat joints on compressor tubing is a business all of its own.

Service men in order to be properly trained must have a smattering of many trades.

Following are letters from two hospitals in the Philadelphia area testifying as to the necessity for adequate and prompt refrigeration repair service for some of the special applications of refrigeration equipment in these hospitals.

### Has 7 Major Uses In Blood Plasma Laboratory

THE BRYN MAWR HOSPITAL  
Clinical Laboratory  
Bryn Mawr, Pa.

Max M. Strumia, M.D. May 6, 1944  
Director

Mr. J. P. Boone  
War Production Board  
Philadelphia, Pa.

Dear Mr. Boone:

It is probably not necessary for me to tell you much about the need for refrigeration at the Bryn Mawr Hospital Laboratory after your visit. I will briefly summarize our need for refrigeration and maintenance of our refrigerating equipment as follows:

1. Low temperature cabinets (-20° to -25° C.) are needed for the study of plasma preservation under the terms of Contract No. OEMcmr-44 with the O.S.R.D. More specifically, we are to determine for a period of ten years how frozen plasma maintains its various properties.

2. Under the terms of the same contract, studies on shell freezing and drying of plasma from the frozen state of plasma and other blood substitutes are being investigated.

3. Under terms of the same contract the effect of low temperature on bacterial life in plasma is being studied. This is carried out with a

special multiple low temperature cabinet (-5° to -40° C.)

4. To carry out the above work, facilities for refrigeration of whole blood at 2-4°C. is needed.

5. Under terms of the already mentioned contract, study is being carried out on the preparation and preservation of a new blood substitute requiring additional space for refrigeration at both plus 2°C. and -20°C.

6. For the routine use of the hospital, we require adequate space for freezing and maintaining at -20°C., of about 200 units of plasma with a weekly turnover of about 50 units. This requires about 16 cu. ft. of space maintained at -20°C.

7. Refrigeration space is required for the maintenance of the blood bank for the routine use for patients at the Bryn Mawr Hospital.

In all, about 10 compressors are essential for our work. They vary from 1/5 h.p. to 1 1/2 h.p. Additional information may be found in some of the publications herewith enclosed.

Very sincerely yours,  
(sgd) Max N. Strumia, M.D.

S/mb  
Enc

### Serum Exchange Declares Cooling To Be Vital

PHILADELPHIA  
SERUM EXCHANGE  
THE CHILDREN'S HOSPITAL  
1740 Bainbridge Street  
Philadelphia, Pa.

Harriet M. Felton, M.D.  
Janet G. Armstrong, R.N.  
Associate directors  
May 10, 1944

Mr. J. P. Boone  
Office of Civilian Requirements  
W.P.B.

Suburban Station Building  
Philadelphia, Pa.

Dear Mr. Boone:  
Our work is to keep a supply of serums on hand, in large enough amounts, to prevent and treat contagious diseases in Pennsylvania, first and the rest of the United States, if possible.

Briefly, this is what we do: names and addresses of adults who have recently recovered from scarlet fever, measles, and mumps are obtained from Bureaus of Health throughout Pennsylvania and New Jersey. These individuals are written to, their physicians are written to, and after proper permission has been obtained, we travel about with bleeding equipment and collect convalescent bloods. The above procedure involves weeks of time.

The bloods are brought into our laboratory for preparation. A minimum of two weeks of work is required before the serum is ready for use. During this time the material must be carefully refrigerated.

Very often individual bottles of serum must be held frozen for several months, until enough have accumulated to form a pool. A pool of serum consists of at least eight individual bleedings, but we form pools of thirty or more individuals. There have been times when we have had two thousand or more bottles of serum stored in the frozen state. These included the precious and scarce convalescent serums, hospital and O.C.D. plasma.

Building up a reserve of this material is a time consuming and expensive process. Refrigeration is absolutely essential. A breakdown of refrigeration, without prompt service, would involve calling into the hospital the entire personnel, buying large quantities of ice, spending hours rapidly thawing the serum and running a chance of irreplaceable loss if we were not able to take care of the situation fast enough.

In addition to the storage of serums and plasma, the hospital laboratories operate air conditioners in experimental animal rooms, where years of careful work on influenza, infantile paralysis and other virus diseases, would be lost if service on the air conditioners was stopped. The experimental animals must be kept in constant temperatures or they die.

It would be fatal to our work if refrigeration service were interrupted.

Sincerely yours,  
(sgd) Janet G. Armstrong, R.N.  
JGA:t Associate Director

## Special Applications Of Refrigeration Used On U.S. Hospital Ship

BALTIMORE—The U.S.S. *Refuge*, refitted this spring as one of the most modern hospital ships afloat, uses an unusual amount of refrigeration equipment in her maintenance facilities.

Not only are the operating rooms fully air conditioned, but the refrigerated spaces now include large compartments for holding meats, dairy products, fruits and vegetables, biologicals, and ice.

The majority of these, extending across the width of the ship, are on the third deck. Here cold storage rooms, together with two ice makers and a freezer cabinet, are located.

The cold rooms are heavily insulated, and cooled with wall coils of tinned copper tubing without fins, arranged along the walls. The coils are mounted upon galvanized supports to form two layers, protected by guards.

Five large cold rooms are on the second deck, and two more on the first, paralleling the tunnels housing the propeller shafts. The refrigerating machinery is between the shafts—three six-cylinder Frick compressors.

Each machine is connected to its own condenser, receiver, gages, and automatic control system. The gage boards, more complete than the usual panel installation, report high and low refrigerant pressure, suction and discharge pressure of the sea-water pump, oil pressure in the machine, and the temperatures held within each of the cold compartments.

There is also a test gage for double check, and vertical extension-stem thermometers at various points throughout the system. A separate 1 1/2-hp. low pressure unit supplies cold drinking water from a scuttlebutt. "Freon-12" is used throughout.

The *Refuge* is not a new ship. Launched in 1920, she made record crossing time from Yokohama to Seattle in 1922. She weathered capsizing, fire, and storms before her heroic rescue of survivors from the wrecked freighter *Nevada* in the Middle Aleutians in 1932.

In 1942 she was sold to the Navy and commissioned as the U.S.S. *Kenmore*, a troop transport. Her refitting operations this spring included strengthening of the entire hull and the installation of modern equipment.

### Daniel Jacobs Heads OPA Radio Pricing

WASHINGTON, D. C.—Daniel L. Jacobs, formerly in charge of radio pricing, has been appointed head of the Radio and Miscellaneous Unit of OPA's Consumer Durable Goods Price Branch. Before coming to OPA, Mr. Jacobs managed the Newark, N. J. branch of York Automotive Distributing Co., radio distributor.

In another personnel change Ernest W. Heilmann, former head of the Radio and Miscellaneous Unit, was named section head with supervision over pricing actions for radios and musical instruments, sporting goods, bicycles, dry batteries and related items, housewares, hardware, luggage, watches, and other personal accessories.

Mr. Heilmann, succeeds George S. Ujlaki, formerly active in retail merchandising with Macy's, Gimbel's, and Sears, who is resigning to establish a wholesale business in New York City.

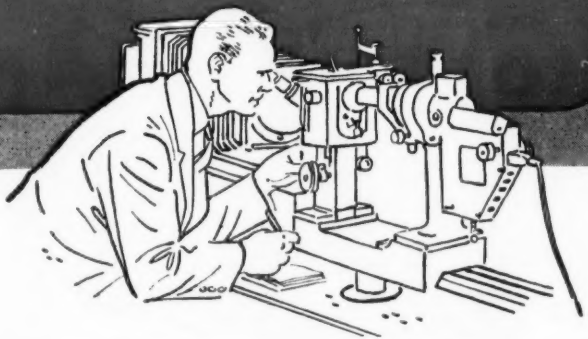


**CORDLEY**  
THE BATTLE PROVEN  
*Electric*  
**WATER COOLERS**

• THE PROVING GROUNDS OF WAR offer dramatic confirmation of the ability of Cordley Electric Water Coolers for shipboard use to the Navy (Contract NK 2982) and to the Maritime Commission. These same units are now available for essential uses on land. Write for facts.

**CORDLEY & HAYES**  
452 Fourth Ave., New York 16  
Manufacturers of Water Coolers For 55 Years

## Exact KNOWLEDGE



THE Advance Die and Tool Company... committed to the building of best Sheet Metal Stamping Dies... determined to acquire exact knowledge of die making steels and alloys.

An extensive series of laboratory tests were conducted to scientifically determine those die making materials which—

### Provide Longest Tool Life Eliminate "Galling" or "Pick-Up"

During these tests, varying heat treating procedures were observed, providing the information necessary to heat treat die materials to the peak of their effectiveness.

Extraordinary performances of hundreds of Advance Dies in the nation's War Production Program attest to the value of exact knowledge. A single instance in which Advance punches were used for drawing steel cartridge cases is typical.

The operation required punches of great strength, freedom from galling and resistance to abrasion. Advance punches consistently produced 300% to 400% more cases than any other punches tried.

Advance Die and Tool Company are using its design and manufacturing facilities in the war effort for the duration... but, when peace comes, plan to use Advance exact knowledge in building your sheet metal stamping tools and dies.

**ADVANCE DIE & TOOL CO.**  
6800 MADISON AVE. CLEVELAND, OHIO



**DOLE**  
VACUUM PLATE  
**COOLING and FREEZING UNITS**  
CHICAGO



## What You MUST Do When G.I. Joe Returns and Wants His Old Job Back

### Interpretation of the Rules For Employers Set Up By Selective Service System

By George F. Taubeneck

WASHINGTON, D. C., July 29—Most business firms have been so entirely occupied by the problems entailed in "getting on with the war" that they have been able to give little thought to the problems of returning war veterans who were on their payroll when General Hershey crooked his finger in their direction.

The problems are there, however, and must be faced in advance; otherwise much confusion, many headaches, and even financial losses may result.

Right now discharged servicemen are in most cases welcomed with open arms, so stringent is the manpower situation. The tune may be entirely different when they are discharged by the millions instead of the thousands, when men are out of work all over the land, when there are no longer any war contracts.

Integral with the Selective Service Act is a guarantee of reemployment. The discharged serviceman can claim his old position or the equivalent in terms of pay and seniority (provided he applies for it within 40 days after his release from service). If you refuse him reemployment, the U. S. District Attorney in his locality will sue upon notification by the veteran.

#### THE ONE EXCEPTION

If your circumstances have changed so that it is impossible to rehire the veteran or veterans, or if he is incapable of handling his old job, then the compulsion does not apply. But the burden of proof is on the employer, and the act will undoubtedly be interpreted liberally in favor of the veterans.

At this point we should note that every employer will without question want to give his former employees who are demobilized every possible break. Morally and sentimentally there's every reason for the employer to cooperate with spirit and letter of the law.

Even so, good intentions are often difficult of fulfillment, and employers might well now begin considering what they can do to give every returning veteran a satisfactory job.

Among the conditions difficult of fulfillment will be that of rehiring a man skilled in a type of operation you no longer employ. Particularly will this be true of manufacturing concerns which converted entirely to the making of lethal weapons or weapon carriers, and which in peace will be making something quite different.

In such cases, the letter of the present law would seem to relieve the employer from responsibility for rehiring the veteran for a job which no longer existed. Nevertheless, the political power of the returning veterans is likely to cause the law to be extended to such a point that you may have to give the G.I. a job of almost any description which he is willing to accept.

What, then, will happen to the people you now have on your payroll? You may feel an obligation to them, because they carried you through a period of labor shortage when you needed them badly.

What it seems to add up to is that practically every firm which is expecting the return of a considerable body of servicemen and service-women must plan on expansion. In the refrigeration industry that expansion seems to be in the cards, anyway.

One thing in this connection is reported over and over again by employers who have welcomed discharged servicemen back to their rolls already: the man comes back a better employee than he was when he left. He keeps his eye on the ball, and his batting average is high.

It is not too early now to begin laying out your reemployment policy, and to study the job-by-job dilemmas which are sure to arise after demobilization.

Note that the law says "unreasonable or impossible." You can bank on it that "unreasonable" will be interpreted to mean "impossible." Such interpretation is likely, for example, in the tough problem of the veteran whose job has been taken over by a former subordinate.

Bad as the ensuing situation may be, you can expect that it will be

considered neither "unreasonable or impossible" for the returning veteran again to become the supervisor of his supplanter—no matter how much of an improvement his supplanter may have demonstrated.

The law also bespeaks "immediate reinstatement." This probably means that if the returned serviceman says he wants to go back to work on Monday, he goes to work on Monday, even if you don't have desk room for him.

This job protection for the veteran lasts for at least one year. The regulations declare that the veteran cannot be discharged except "for cause" within one year after reemployment.

To be upheld by the courts, that "cause" will have to be unimpeachable. Nor can you depend on it that one year will be the limit. If the veteran's lobby works as fast and thoroughly as many expect it to, that "one year" is likely to be extended.

Furthermore, during that initial year, he cannot be demoted—in salary at least—for any reason whatsoever.

Many employers seem to believe that the veteran can be reinstated at his old salary. Fact of the matter is that he must go back on the payroll at that rate, but if he can demonstrate that the employer is now paying a higher rate for the same job, he can demand—and get—the higher pay. So don't look to returning veterans as a simple means of easing your payroll burden.

Veterans go on accumulating seniority rights and privileges during their service, just as if they had been continuously employed during that period. This is not primarily a problem for the employer, but oh! what a headache it will be for the unions!

#### WHAT DOES 'QUALIFIED' MEAN?

Here is a tough one: the law specifies that the veteran must be "qualified" to hold his old job. Supposing, through increased efficiency of your operation, increased knowledge, added duties, and new techniques, those presently employed on the veteran's old job are now performing work he is not "qualified" to do.

The answer is: the employer cannot impose higher standards for the veteran than existed at the time he left for service. Also, if through physical or other reasons the employer has doubts that the veteran is "qualified" he must give him fair and adequate trial.

Suppose, in an extreme case, that you have adopted a policy of hiring only women. Or suppose the civilian who replaced him has accumulated greater seniority. Or, perhaps you have promised his replacement—even through a contract—a "permanent" job.

In all cases, the answer is that the veteran gets the job and the replacement is out.

Here's another one. Suppose that the veteran was an A. F. of L. member, and since his leaving you have signed a closed shop agreement with the C.I.O. The A. F. of L. veteran gets his job back, and he doesn't have to join the C.I.O. All sorts of complications are expected from this one.

Some employers who have had a closed shop forced upon them are even hoping that returned veterans may help them break the stranglehold. It is one of the political-dynamite situations that lead Republicans to believe they'll win in 1948, even if they lose in 1944.

How about giving the returned soldier a job equivalent in pay, etc., to his old one, but in a different plant or city? The law is interpreted as holding that the veteran has the choice. If he wants to stay

in Chicago, he stays in Chicago.

Many employers are worried over the knotty problem of having hired two, three, or more men for the same job, only to see them all go into service in succession. Rule is that the first veteran to have the job gets it on return.

What happens to the other veterans remains to be determined; but you can bet on it that Congress will find some way of looking after them.

One modifying clause in the regulations states that the veteran is entitled to reemployment if his job was "other than temporary." Here the burden of proof will be on the employer.

Expansion for war work will not be regarded as "temporary" employment. Nor will an employer-employee contract having a fixed expiration date.

Part-time work will probably be considered temporary, but little else will be, unless the conditions of the contract or agreement expressly stated that the employment was temporary.

Big problem will be that of competition for jobs between militant organized unionists—pampered by the labor shortage and spoiled by extravagant take-home pay—and the equally militant returned soldier and sailor who have lived a dog's life at low pay, continually endangered their lives, and been increasingly irritated by news of strikes and riotous living on high pay by those who took over their jobs after they left to risk their lives for their country.

On the brighter side of the picture are the opportunities which will exist for returned warriors as salesmen.

With Uncle Sam as the chief customer, and a seller's market prevail-

ing in all lines, salesmen and salesmanship have almost disappeared.

Practically all merchandising organizations will have to start from scratch and rebuild in order to cope with the buyers' market which is coming.

Many keen merchandisers believe that G.I. Joe will be an ideal salesman. He will have been taught initiative and self-reliance—two prime ingredients of good salesmanship. He may also be restless, and unwilling to enter into the humdrumness of desk or shop employment.

He may also be in a hurry to "catch up" on the good things of life. If he interprets the "good things" in monetary terms, he'll be more interested in working on commission than on salary.

However, he'll have to be trained. So many alert sales staffs are even now preparing sales-training courses for veterans. And they are writing former employees in service telling them about these courses and their opportunities, and asking them to be on the look-out for good prospective salesmen among their buddies, as well as enlisting their own interest and dreams.

One interesting point is that many a former employee, who might have plodded along through life contented in a routine job, has been elevated through war training to a position of authority and high income.

Boys are colonels today, and young men are generals. Their income, their social station, their responsibilities, their power are far greater than they ever enjoyed previously in civilian life.

What to do with them? Well, these returned officers present their

employers with their greatest challenge. Properly fitted into civilian staffs, given opportunities commensurate with their recently revealed talents and capabilities, they can help many a concern grow and prosper.

They'll come back with fire and ambition, youth and exuberant health. They can do much to relieve the old men of this country—the men who have earned retirement but who have been forced to work harder and worry more than ever before in their lives—from the mind-breaking efforts which will be required of all concerns in the next decade if we are to preserve free enterprise in America.

But don't expect these men to drop back quietly into their old pursuits. Either give them opportunities which will challenge everything they've got and have become, or expect them to go into business for themselves.

Of course, the reemployment of returning servicemen will present problems. But it also spells opportunity. The employer must expect a time-lag before former employees regain their efficiency and usefulness.

He must also expect to wait long before they regain their creativeness and independence—depending on how long they've been in service—after the enervating period they've known of mental and physical torpor and numbness.

But properly equipped with refresher and training courses, the employer can take back these boys reassured by the knowledge that the law and the politicians are with him, and that grievances he has learned to suffer in silence from wartime substitute employees will no longer be a necessary thorn in his side.

**TODAY,** thanks to pioneering by Philco engineers, Philco Refrigerator owners enjoy the vital added service of ample frozen storage space. For Philco was the first to recognize...and do something about...the modern trend toward frozen foods and sub-freezing storage. Before the war, Philco dealers were able to offer a complete line of Philco Refrigerators with full size separate Frozen Food Compartments. With this and other exclusive features created by Advanced Design, Philco dealers had a new kind of refrigerator to sell, giving them the highest average unit sale in the industry!

**TOMORROW** new refrigerators originated by Philco Advanced Design will make the Philco franchise even more attractive and profitable to appliance dealers. Pre-war experience in frozen storage plus new pioneering ideas will add new conveniences, new selling features to the Philco Refrigerator of Tomorrow. Leadership in progressive engineering and aggressive merchandising will give Philco dealers their biggest opportunity for volume sales and higher profits-per-sale.

A full size, separate  
Compartment for  
**FROZEN  
STORAGE**  
IN ADDITION TO THE  
REGULAR ICE CUBE CHAMBER

**PHILCO**  
*Famous for Quality  
the World Over*

Tune in the Radio Hall of Fame Orchestra and Chorus with Paul Whiteman. Sundays, 6 to 7 P.M., E.W.T., Blue Network.



# How the Army Transforms 'GI Joe' Into a Refrigeration Repairman

## Soldiers Are Taught Basic Principles, Then Get Needed Experience in Field

By Major Raymond C. Gunther, Quartermaster Corps,  
Officer in Charge, Refrigeration School,  
Army Service Forces Training Center, Camp Lee, Va.

The sciences based on phenomena and practical or mathematically proven theory have long been employed by man in his unceasing efforts to establish better and more comfortable modes of existence so that he might thus achieve a more abundant life.

The successful culmination of experiments carried on in the development of the various phases of science have necessitated a thorough knowledge of involved principles of natural actions and reactions by the experimenters. We know these experimenters as scientists. They may be doctors of medicine, chemists, astronomers, or physicists, depending upon the nature of their endeavors, but their efforts are all based on one or more series of facts or phenomena

and/or a combination of both, depending upon the complexities of the subject under research.

From our earliest history man has shown a great interest in the development of better and more convenient ways of accomplishing that necessary work which was required, not merely for existence, but for a more comfortable living.

One of the earliest problems foremost among the requirements for existence was, of course, that of obtaining food. But once obtained there remained the equally important problem of storing it against the day when its sources were temporarily eliminated for various reasons. Thus there arose the necessity for investigating a method for the storage of such foods which resulted in the first

step of that science which we have come to know as refrigeration.

Since those early days when food was placed in caves in order that it might remain edible during the required storage periods, many strides have been made in the development of the science that has resulted in our present day refrigeration methods.

This forward progress has been made possible because of the research development made in Thermodynamics, gases, and machinery, the basis of which owe their beginning to scientists from distant parts of the world, many of whom were not contemporary, and whose fields of endeavor were remote from each other.

### MUST KNOW PRINCIPLES

Out of all of this there eventually appeared a tangible "something" that could be used in a practical manner to serve and benefit man. But in order to fully understand this tangible "something" and take advantage of its potentialities, a deep knowledge of the fundamental principles developed over this long period of time must be thoroughly comprehended. As a result institutions of learning have been organized in order that individuals may take advantage of the results of the labors and research of those who have gone before and also of those who still search.

### AFTER PEARL HARBOR

Then came the day, Dec. 7, 1941, when our nation was attacked without warning and those leisurely methods of teaching and studying ceased, and our tempo increased in proportion to the blast of the bombshells which brought them to an end.

In order to meet the war emergency and successfully cope with our enemy, it was necessary that the manpower capable of performing the duties incident to the successful maintenance and operation of all equipment of war be supplied from the citizenry of all walks of life. In addition it had to be made available in such numbers as precluded the hope that men suitably trained to fill the requirements for such work were already obtainable in sufficient numbers.

### FUNDAMENTALS CONTROL

The needs of the Army were and are for practical men who can operate and maintain this equipment in the field under adverse conditions and who, in their maintenance, must be able to do much improvising in order to keep machinery operating.

The Army cannot provide the time during this emergency to allow selected individuals to delve into the intricacies of science that has provided this type of equipment. Yet the necessity exists for educating the prospective refrigeration technician to a knowledge of the essentials he must be familiar with if his work is to be properly done.

This task has been a stupendous one and has resulted in the preparing of Army school curriculums so as to eliminate much of the details but leave sufficient content to provide the student with a proper basis for the analysis of operating difficulties so that he is able to keep equipment in operation.

### PROGRAM IS DEVELOPED

The result of all of this is our present program for the training of Quartermaster refrigeration students at the Army Service Forces Training Center, Camp Lee, Va., formerly designated as the Quartermaster Replacement Training Center, where men of varying degrees of prior experience in refrigeration are sent to study in order to furnish necessary manpower to fill the Army's requirements in refrigeration.

Since refrigeration is a complex subject, the Army technician forms a relationship with the scientist in the necessity for understanding the laws of natural phenomena as written by Dalton, Pascal, Boyle, Charles, Gay-Lussac, and others. Even though the names of their discoverers may not long remain in the memories of the students after leaving the school, their principles must, for who but those of thorough understanding could diagnose difficulties in the refrigeration system?

(Concluded on Page 13, Column 1)



These two refrigeration trainees from Camp Lee, Va., are unloading a carcass of lamb from a refrigerated trailer to issue for ration breakdown during field training. After their basic military and technical course, trainees spend two weeks in intensive field activities.



Adjusting portable "Freon" equipment in the Quartermaster Refrigeration School are (left to right) Cpl. Virgil P. Warren, formerly with the Warren Co., Inc., Atlanta; Pvt. Jack C. Bowman from the Coca Cola Co., Atlanta; and Pvt. Willard S. Marlow from the Mayfield Refrigeration Service, Atlanta.

Dear Jim:

Just dropping you this note because I know you are interested in a lot of questions regarding deliveries on condensing units.

We are producing conventional units for rated orders but deliveries to us of electric motors are still very slow. Just when this situation will ease, we cannot say. I'd like to suggest that you anticipate your needs by about six months.

As you already know, there is an increasing demand for compressors because of the growing replacement market. However, our deliveries are holding up well. Better figure on about two or three months on compressors.

The next time you are down to Detroit, won't you stop off at Tecumseh. It'll sure be good to see you and we can talk things over. We have a first class engineering staff that'll answer just about any question you can think of, either for now or after-the-war refrigeration planning.



Chieftain

TECUMSEH  
PRODUCTS CO.  
TECUMSEH, MICH.

Manufacturing the finest type refrigeration compressors and condensing units on the market today as a result of high precision machining processes. Write or wire our sales department today for help on postwar designing.

## STAND-GUARD!

with STANGARD COLD PLATES, prime surfaced, to insure higher refrigeration efficiency; they are light in weight, structurally strong and low in cost.

For locker plants, sharp freezing, hardening rooms, soda fountains, storage rooms, milk coolers, liquid cooling, food counters and other similar uses.

Write to us for further information

STANGARD-DICKERSON CORP.

46-76 OLIVER STREET

NEWARK, NEW JERSEY



## Army Runs Tests on Shop Equipment



Standing at the control panel containing recording instruments used in tests on refrigeration equipment is Major Raymond C. Gunther, officer in charge of the school. At left is Sgt. Kenneth S. Franklin, formerly with Fielder & Warren in Belmar, N. J. At right is Sgt. Melvin E. Griffing, who formerly operated the Eastern Refrigeration Service of Bridgehampton, N. Y.

## Training Concentrates On Shop Practice

(Concluded from Page 12, Column 3)

This task assumes a magnitude of vast proportions when we consider that the Army seeks in the short time allotted to create an efficient practical refrigeration technician. Distinction may not be the reward of all our students and we do not claim that all become skilled technicians but we have succeeded in providing the foundation upon which the student can build and which, with additional experience, will provide the Army with enough personnel to meet its needs.

The day has long passed when Alexander the Great detailed soldiers to carry snow from the mountains in order to cool his wine. Armies also have so increased in size as to eliminate the possibility of furnishing fresh foods to its men by capturing the enemy's live stock and produce as was true up to as late as our own civil war.

### SUPPLYING THE ARMY

Today foods are preserved in fixed cold storage plants located back of the fighting zones, and are transported to the fronts by means of mobile refrigeration trailers, each equipped with a refrigeration unit capable of maintaining sufficiently low temperatures within the storage compartment of the trailer to preserve such perishable items as meats, dairy products, and vegetables for consumption by the fighting men.

It is this part of the system of supply in which the refrigeration technician is most vitally interested and it is to prepare him for the maintenance and operation of this equipment that is the goal of the Quartermaster Refrigeration School at Camp Lee.

### PROGRAM MEETS OBJECTIVE

The program, as finally developed at the Refrigeration School, is meeting its objective. The course is divided into two principal parts, namely, two weeks of classroom instruction and six weeks of shop practice, a total of eight weeks.

In the two weeks of classroom, the student is taught the fundamentals of the refrigeration cycle, properties of refrigerants, insulation material, diagrammatic principles of equipment such as electric motors, compressors, condensers, evaporators, service and expansion valves, heat exchangers, and liquid receivers.

From there he enters the shop where he receives instruction and performs practical work in welding, bending and flaring of copper tubing, and use of tools. His education is continued with the assembly and disassembly of the various necessary valves, condensers, and evaporators used on mobile and fixed refrigeration plants.

### HIGH SPOT IN TRAINING

The high spots in the training of the students come during their sixth and seventh weeks when service problems are studied. These problems consist of finding the source of

troubles that have been developed by the instructors and which are unknown to the student upon starting his investigation.

It is felt that this method of training develops a natural ingenuity in the student and also emphasizes many of the principles which he must understand in order to diagnose operational difficulties. Most of this work pertains to the mobile refrigeration unit of which there are sev-

eral manufacturers' equipment involved and upon which the majority of the students will come in contact with after finishing the course.

During the eighth week of instruction most of the student's time is spent on the 3½-ton ice plant that is operated within the school. This plant employs ammonia as a refrigerant and gives the student some diversification in refrigeration plant operation aside from the "Freon" systems which are predominant in the mobile unit field. Sulphur dioxide and methyl chloride systems are also included in the student's training.

### COLD STORAGE CONSTRUCTION OUTLINED IN COURSE

Dispersed throughout the course in logical sequence, the student is instructed and performs some work on insulation materials and cold storage room construction, knowledge of which will benefit him if he is ever in a locality that requires the building of cold storage rooms out of whatever natural materials may be available. And since mobile refrigeration units are operated by means of small gasoline engines, a brief period of instruction on such equipment is also given.

In order to affect a better portrait of principles and fundamentals surrounding the science of refrigeration and concentrate this mass of information, an ambitious but efficient visual aid program has been organized at the school. These visual aids include diagrammatic charts as well as moving models which simulate actual operations of the intricate equipment involved. These have been found highly successful for the purpose for which they were intended.

## Repairs Must Be Made In Field



Soldier-trainees at the Camp Lee school are taught maintenance and repair of mobile refrigeration trailers which supply food to the armed forces in the field. Removing a cold plate from a trailer are Pvt. Harold Durgan (in trailer), Pvt. James V. Kovacs, and Pvt. Olin D. Hill.

# "MICROMETER CONSCIOUS"

*in the quantity production  
of minute precision parts*



Forty-five manufacturers of major prominence now are relying upon the micrometer-conscious Wadsworth Small Parts Division for scores of parts so minute and precise that their quantity production is difficult or expensive for the average plant.

At Wadsworth, such production is customary, and meets the highest critical standards.

Here, a unique machine setup and workers who think precision are intimately associated under one roof. They contribute special operations to many pieces and carry others through in their entirety, in great quantities.

We welcome conversations with all companies who intend to be postwar factors in their fields and will be glad to discuss the matter of applying Wadsworth skills to your special needs.

### WADSWORTH FACILITIES

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THE **Wadsworth** WATCH CASE CO., Inc.  
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Wadsworth is heavily engaged in many-sided war work. But our steady production of Military Watch Cases and our constant designing of the precious metal cases for the future are preserving the art of fine watch case development.



## Air Corps Thermometer Test Stand Called For Temperature Range of 311° to -103°F.

### Unique Installation Is Complete In One Enclosure

By F. M. Bennett, Refrigeration Economics Co., Canton, Ohio

One of the most unusual refrigeration applications that we've engineered for the Armed Services was a thermometer test stand for the Army Air Corps.

Purpose of this unit is to test the temperature control equipment which is used by the Air Corps. Each instrument is tested at various points in its range.

Specifications called for 12 wells to be held at various temperatures from -103° F. to 311° F. Temperature control was to be within limits of plus or minus 1/2° C. and the temperature in each well had to be uniform within 1/10° C. at all points. The equipment was to perform to specifications in an ambient temperature of 120° F. and without running water.

Amount of space to be occupied by the entire unit was limited to 60 inches wide by 36 inches deep by 48 inches high, with specifications calling for a type of construction that could be shipped to any part of the world, ready to be plugged into an electric supply and operate.

To meet these specifications we placed the 12 wells in a steel cabinet, insulated with 8 inches of sheet cork and Santocel insulation. A control compartment was provided which paralleled the six low-temperature wells.

The two-stage "Freon-22" compressors and the necessary gauges, starters, resistors, relays, evaporative condenser, receiver, motors, and pump were installed in the base below the wells and the control compartment.

An evaporative condenser was selected to permit operation at 120° F. ambient temperatures without use of running water. For temperatures near the maximum the Air Corps agreed to carry water and keep the condenser pan full. For moderate ambient temperature no water is used and the units are air cooled. An automatic control cuts in the water circulation when condenser pressure reaches 180 lbs. and shuts down the pump at 150 lbs.

#### HOW IT IS CONTROLLED

Temperature in each well is controlled by a Fenwal thermostat which is guaranteed to control within plus or minus 1/10° F. For the cold wells the thermostats work through two-pole relays to open liquid and suction solenoid valves and start the refrigerating machines.

For the hot wells the thermostats control electric heaters, and these heaters have resistors in series as the Air Corps insisted they all be of the same wattage so resistance was

necessary to prevent excessive heat to the moderate temperature wells.

The testing unit has 12 wells to be maintained at temperatures as follows:

Well	Temperature in ° F.
1	-94
2	-58
3	-22
4	14
5	50
6	86
7	122
8	158
9	194
10	230
11	266
12	311

Wells Nos. 1 to 6 inclusive have cooling coils and wells Nos. 6 to 12 inclusive have electric heaters of 100 watt capacity. Capacity of the heaters may be reduced by resistance coils provided for each.

Temperature control is by means of Fenwal thermostats, one cooling type in each well No. 1 to 6 inclusive and one heating type in wells Nos. 6 to 12 inclusive. Each control circuit is controlled by a snap switch, so that any well may be cut out.

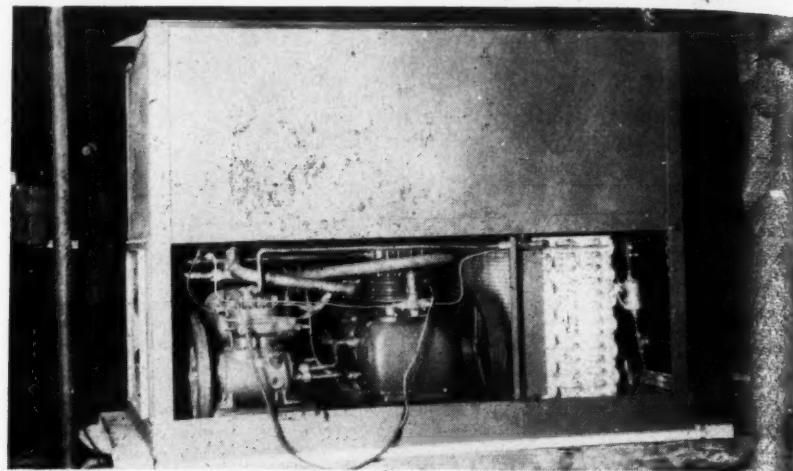
Well No. 6 which has both heating and cooling is controlled by switches 7 and 6 respectively.

Any thermostat in wells Nos. 1 to 6 will start the refrigerating machines and open Detroit Lubricator Co. solenoid refrigerant valves which control supply and return to the respective wells. Refrigerant flow control is by Detroit Lubricator thermostatic expansion valve.

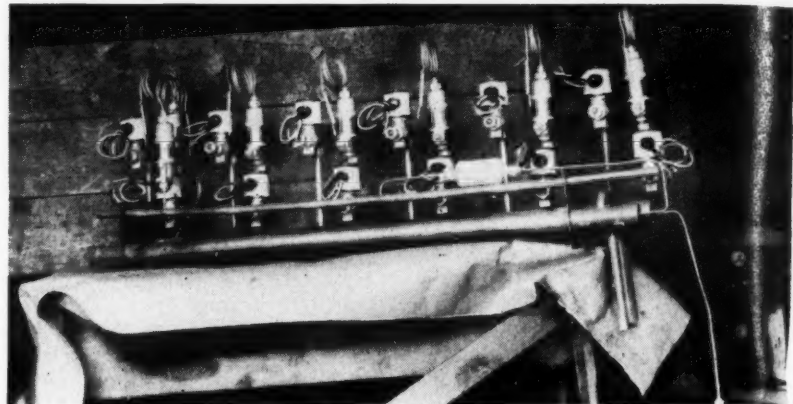
Electric control is from thermostat to two-pole relay to motor starter and solenoid valves.

A seventh refrigerant solenoid

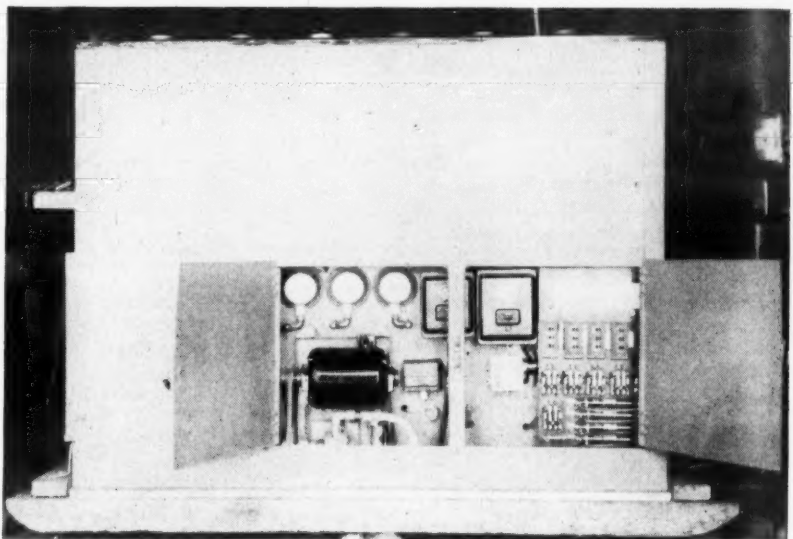
## Test Equipment Is All In Single Cabinet



Machine compartment of the thermometer test stand made by Refrigeration Economics Co. and showing the condensing units that form the two-stage system necessary to create the -103° F. temperatures.



Control of the refrigerant flow to the six "cold" thermometer test wells is by the setup above, shown before installation in the cabinet. Each well has its own thermostatic expansion valve and solenoid valve.



This compartment is separate from the machine compartment and houses the relays and other parts of the electrical system, and the pump.

valve is in the main liquid line and opens when the refrigerating machine starts.

The two stage refrigeration compression system is comprised of a General Electric CM-63 machine operated at 820 r.p.m. by a 3-hp. motor for the low stage, and a CM-43 model with a 1 1/2-hp. motor operated at 910 r.p.m. for the second stage. Each compressor motor is controlled by its starter provided with overload protection and an "on-off" automatic switch.

#### UNUSUAL CONDENSER ARRANGEMENT

Refrigerant is condensed by a 6-row air-cooled condenser, the air being drawn through the condenser by a fan on the 1 1/2-hp. compressor motor. When ambient air temperature is too high for successful air cooling and condenser pressure goes up to 180 lbs. gauge a Minneapolis-Honeywell controller starts a water pump which sprays water from the condenser pan over the condensing coil, thus converting the condenser to the evaporative type.

Thus in hot weather, water must be maintained in the condenser pan, and a float valve is provided for the purpose, if running water is available, otherwise it being necessary to carry water for the purpose.

Liquid refrigerant flows from the receiver through a sight glass, a strainer, a dehydrator (by-passed), a second sight glass, a solenoid valve, a heat exchanger located in the control chamber to superheat the suction gas to the first stage, a liquid sub-cooler operating at intermediate or second stage suction pressure, and from there through respective solenoid liquid and thermostatic expansion valves to the coils requiring refrigeration.

A thermostatic expansion valve controls the flow of refrigerant to the liquid subcooler, and there is a second liquid strainer in the liquid line after it leaves the subcooler.

Suction strainers are located in the compressor manifold.

Pressure gauges for low, intermediate, and high pressure are on the control panel and the low pressure gauge valves should be closed when the unit is shut down to protect them from excessive pressure.

High pressure cut-out prevents operation at excessive pressures.

#### LIQUIDS ARE CIRCULATED

Liquids in the test wells are circulated in the cycle of out at the top, in at the bottom, by means of vertical agitators driven from ball bearing line shafts by means of round rubber belts. Replacement belts are in place for each agitator. The vertical agitator shafts run in ball bearings encased in lignum-vitae wood housing and the agitators should be removed, cleaned in solvent, and re-oiled as required.

To protect the first-stage compressor from excessive duty during the cooling pull-down period it is recommended that only one well be turned on at a time. Under this procedure it is recommended that the wells be cooled down in the order of 6-5-4-3-2-1.

The liquid dehydrator should be shut off (by-passed) at all times unless there is some indication of moisture in the refrigerant.

In this installation failure of a thermostatic valve to open may indicate moisture, or dirty strainer in the valve, or a defective power element. Failure of a thermostatic valve to close may indicate moisture or mechanical friction due to dirt, or a defective valve.



The same Worthington skills that helped design refrigeration equipment for high-octane aviation fuel . . . or helped simulate stratospheric conditions for engine test cells . . . will help you obtain the most efficient, trouble-free air conditioning equipment in the competitive days to come.

Why not find out - today - how many of the essential parts of an air conditioning system Worthington will be able to supply. In many cases, complete unit responsibility has contributed greatly to economical maintenance and dependable, long-lived performance.

Investigate, also, the many historic air conditioning installations, including the New York Stock Exchange in 1904, which have built up the backlog of Worthington experience on which you - your clients and customers - can rely. Worthington Pump and Machinery Corporation, Harrison, N. J. District Offices and representatives in principal cities.



AR4-9



## Flying Refrigerator Helps Save Lives



Net weight, 106 pounds. That explains the unusual feature of this refrigerator, designed for Army use in preservation of foods, serums, vaccines, and other perishable products in flight. Aluminum is used throughout in the construction, even to the compressor (with the exception of some of the working parts).

## Airtemp's Aluminum Refrigerator Enables Army to Fly Medicines to Farthest Outposts

DAYTON, Ohio — Flying across vast oceans on errands of mercy, long range transports and patrol planes carry priceless life-saving serums and vaccines as well as certain foods to far-flung theatres of war. Many vital, perishable medicines of this type must be kept under refrigeration during shipment.

For this purpose the Airtemp Division of Chrysler Corp. has developed a compact, custom-built refrigerator for airplanes, marked by use of aluminum in both cabinet and compressor construction.

Naturally, size and weight are the greatest considerations in this important aviation application. This compact 4½ cu. ft. unit requires less than 3.5 square feet of floor area. Particular attention has been given to reducing weight to the minimum—consistent with structural strength—without loss in capacity or operating efficiency. The net weight of the unit is 106 pounds.

All of the parts of the Airtemp radial compressor are made of aluminum to conserve weight, except certain internal parts where aluminum is not practical. Compressor features include superfinished vital moving parts, fine balance, and removable cylinder liners. The refrigerant used is "Freon-12."

The compressor is driven by a ½-hp. motor of the special light weight aircraft type connected to the compressor shaft by V-belt. This 1,750 r.p.m. shunt-wound motor operates on 24-volt direct current, but a dual voltage system is available which makes provision for the operation of the refrigerator, not only on 24-volt direct current, but also on 110-volt alternating current.

This means that when the plane is in the air the refrigerator operates from the plane's electrical system and on the ground it operates from commercial current when such current is available.

The cabinet is made of 22-gauge aluminum, reinforced with aluminum structural angles. It is finished inside and out with white dulux enamel. An adequate vapor seal is provided and an efficient 3¼ inch insulation is used between all of the cabinet walls.

The all-aluminum direct-expansion type evaporator is equipped with two ice trays, freezing approximately 3 pounds of ice at one time. An

aluminum defrosting tray is provided with suitable clips for anchoring it in place below the evaporator.

Two light weight aluminum shelves have their front edges turned up to prevent containers from sliding off. The cabinet door is supported and fastened by light durable hardware and the latch provides an efficient sealing force for the gasket.

Machine compartment is amply ventilated, the rear being open and the sides and front having open grilles. Four anchoring lugs, in addition to base plate provision for deck bolting, provide a practical and sturdy means for securing the refrigerator in place.

The thermostat has an adjustable range to maintain cabinet temperatures of from 35° to 50° F. An aircraft relay is installed in the thermostat circuit to carry the starting and running current of the motor.

Other construction features include an automatic expansion valve of the adjustable type; back seating type suction and discharge valves, fitted with seal caps; a 4-blade aluminum condenser fan directly connected to the motor shaft; and a condenser coil of finned tube construction made entirely of aluminum.

In addition to the dual voltage electric motor which permits the operation of the unit from standard commercial current while the plane is on the ground, several other optional features are available. Standard Air Corps type carrying handles, recessed within the side walls of the refrigerator can be provided. A set of special biological drawers may be had for convenience in storing serums and vaccines. An electric heating thermostat and strip heater can be installed to prevent the temperature in the refrigerator from going below the freezing or other pre-determined point.

According to Chrysler Airtemp engineers and commercial airline officials, similar refrigerators will be used in the postwar period to preserve food for passengers aboard transport planes as well as for transportation of certain civilian medical requirements.

Service medical men have reported miraculous deeds of mercy made possible by Chrysler Airtemp's innovation in high altitude refrigeration but no actual case histories have been made public as yet.

## Forced Draft Units Will Cool 'Cave'

ATCHISON, Kans.—A forced draft refrigerating system in which brine will be used as the refrigerating medium will "cool down" the huge limestone cave near here that is to be used by the Government as storage space for perishable foodstuffs.

The underground refrigerator will be fitted with refrigeration units to store 3,500 train carloads of perishable food for the War Food Administration. It is claimed that construction of a building with equivalent floor space would cost \$15,000,000; installation of the refrigeration system in the cave is not expected to cost more than one-tenth of that amount.

The project is the idea of Lt. Col. Ralph W. Olmstead, deputy director of WFA's Office of Distribution. When the matter of finding additional storage space for perishables became urgent, he recalled his boyhood visits to chilly caverns in the western part of the country.

He directed a search for possible sites for a cold storage project, and the Atchison mine was turned up.

It is a limestone mine from which hundreds of thousands of tons of

crushed rock have been quarried to form a cavern equal to four square blocks in area.

Extending straight back into the side of a hill, the floor, in some places, is 125 feet below the surface. At intervals are approximately 100 stone pillars to hold up the ceiling.

Refrigeration systems will chill brine which will be piped to evaporators throughout the cave. From these units chilled air will be blown through ducts into the storage spaces.

Engineers estimate that it will take 45 days to bring the entire area inside mine down to required temperatures, in some cases as low as -28° F. They believe that once the "pulldown" is accomplished that proper storage temperatures will be relatively easy to maintain.

## Cook Joins Perfex Controls Division

MILWAUKEE.—H. Dale Cook has joined the Controls Division of Perfex Corp. in a sales engineering capacity.

Mr. Cook comes to Perfex from the General Controls Co., Glendale, Calif., having served that company's Chicago branch for the past five years. Previously he was associated with the Minneapolis-Honeywell Regulator Co.

## Chrome Steel Okayed In Heater Reflectors

WASHINGTON, D. C.—The use of chromium-plated steel for heat reflectors in radiant reflectors is permitted by Order L-23-c, Domestic Cooking Appliances and Heating Stoves.

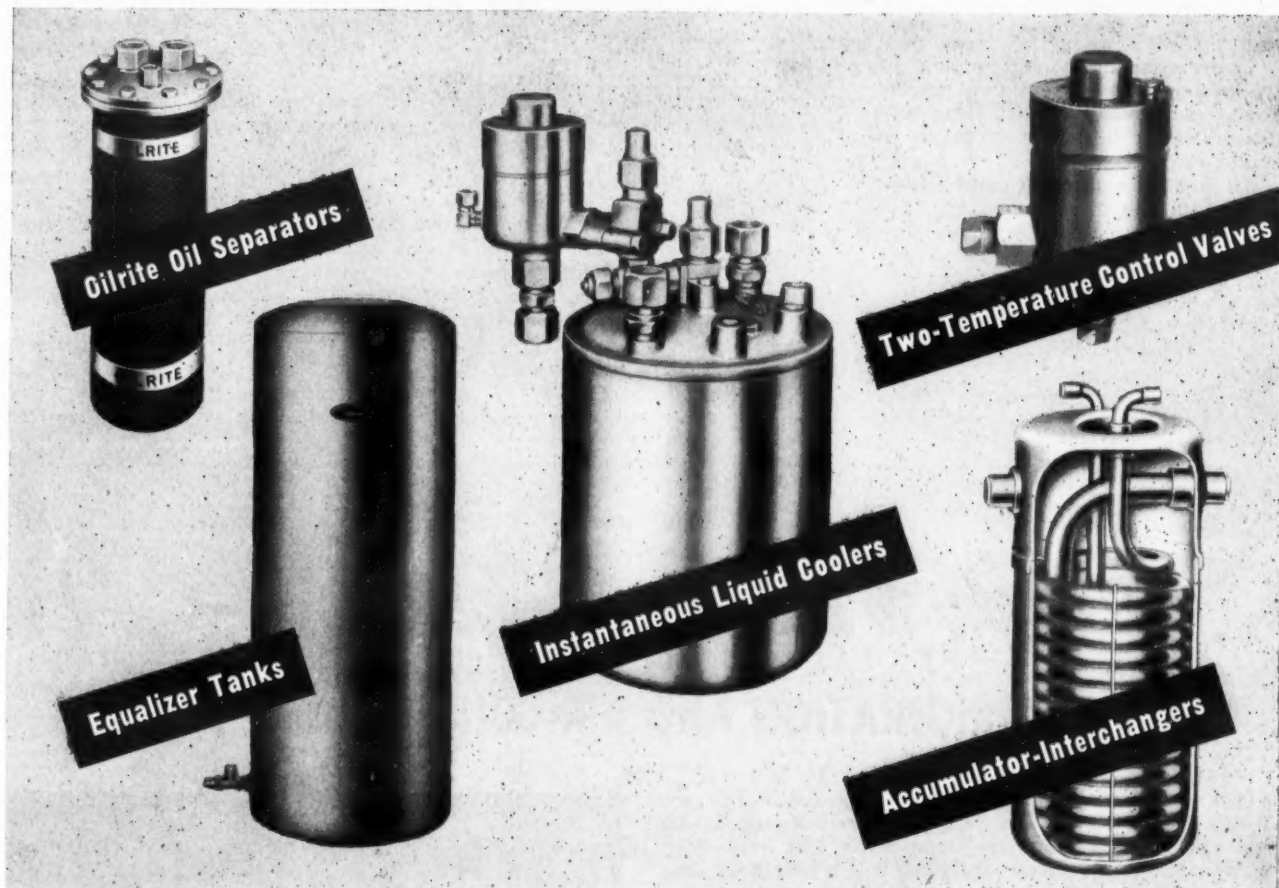
The interpretation was made to eliminate confusion in the industry, WPB said. Some manufacturers did not know whether restrictions prohibiting the use of chromium-plated steel for trim and "bright work" also barred its use in heat reflectors.

Since the use of any substitute material for heat reflectors would result in high floor temperatures and an increased fire hazard, it was decided that chromium-plated steel should be permitted for these reflectors, WPB said.

## Iverson Is Elected To Controllers Institute

NEW YORK CITY—Harry M. Iverson, controller of the Carrier Corp., has been elected to membership in the Controllers Institute of America. The Institute is a technical and professional organization of controllers devoted to improvement of controller-ship procedure.

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## These TEMPRITE PRODUCTS for the replacement of defective equipment

**DEALERS:** Here's an opportunity for you to sell replacement equipment to those companies that are classified as essential.

With increasing breakdowns of refrigeration equipment, industrial plants are now ready to buy new accessories for their existing equipment.



### ATTENTION, DEALERS

Automatic priority assistance is now available for replacement of defective equipment already installed. Write our sales department today for details.

Temprite's complete line of refrigeration accessories and their applications are:

**INSTANTANEOUS LIQUID COOLERS**—For cooling water, light oils, alcohol, brines, acids and caustics.

**OILRITE OIL SEPARATORS**—For keeping oil out of low-side evaporator coils, thereby improving operation and increasing system capacity.

**TWO-TEMPERATURE VALVES**—For maintaining constant temperatures on all types of evaporators.

**ACCUMULATOR-INTERCHANGER**—A liquid line, suction line heat exchanger used to increase capacity and to eliminate refrigerant slop-over. Especially valuable on low temperature applications.

## PREMIUM for PRECISION

M. & E. split-hair precision in ordnance production enables split-second firing on the battle front. The manufacturing principles involved in producing ordnance—in which a premium is placed on precision—are a natural follow through on the old established M. & E. practice in compressor construction. M. & E. postwar compressors will again reflect this quality craftsmanship.

EST. 1866

MERCHANT & EVANS COMPANY

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# TEMPRITE PRODUCTS CORP.

Originators of Instantaneous

Liquid Cooling Devices

43 PIQUETTE AVENUE

DETROIT, MICHIGAN



# Carrier, G-E, and York Cooperate to Produce a Refrigeration System For the Maritime Commission's New Fleet of Victory Ships

**Each Manufacturer's Complete System Is Standardized for Interchangeability**

**Factory Assembly Cuts Shipyard Labor Time On Unit Installations**

BLOOMFIELD, N. J.—Under the direction of the Maritime Commission, George C. Sharp, Naval architect, and the combined engineering staffs of the Carrier Corp., the General Electric Co., the York Corp., a ship's stores refrigeration system of unusual efficiency has been completed for the Maritime Commission's new fleet of Victory Ships.

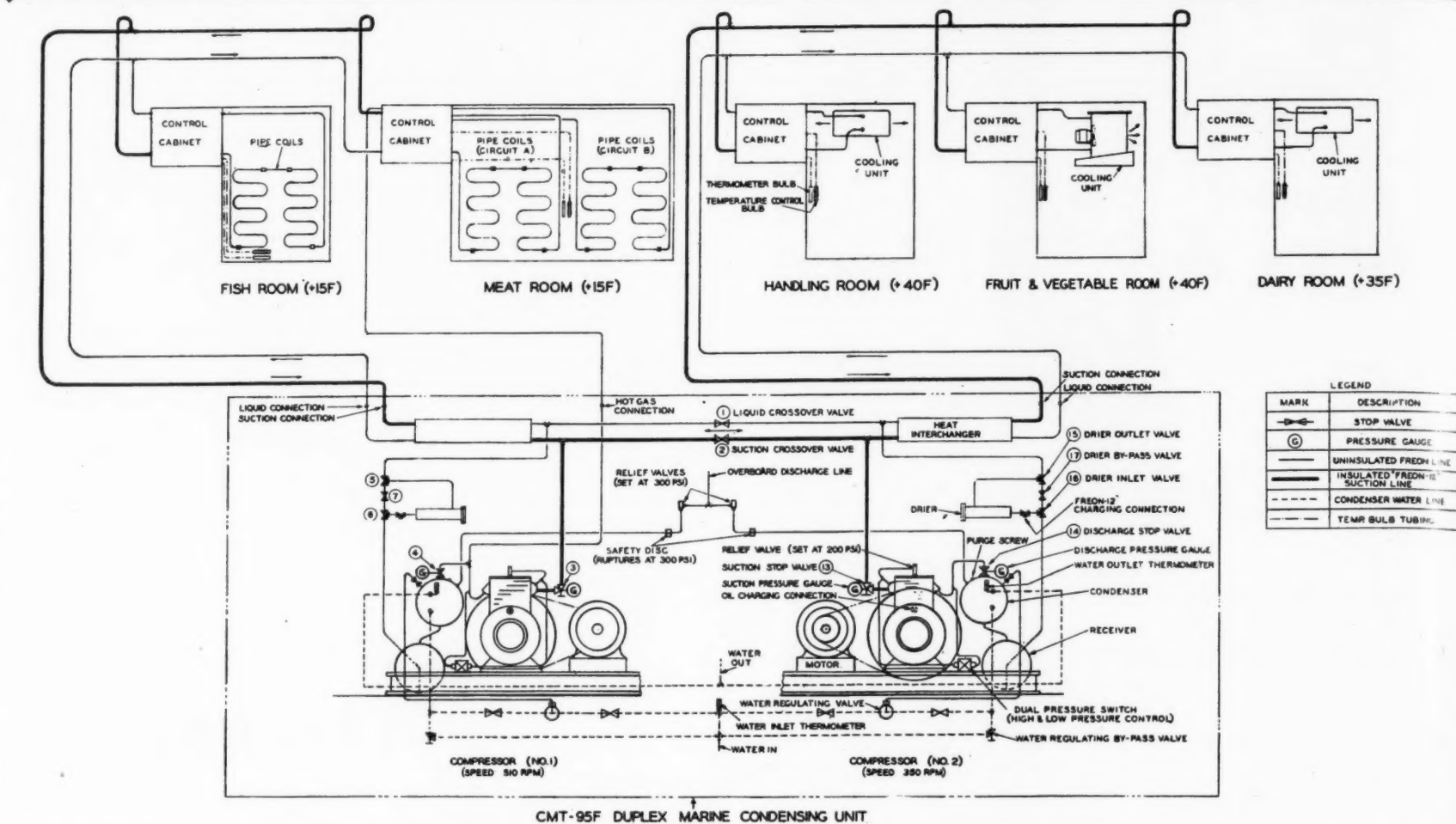
The refrigerated spaces in each ship consist of the following:

Use	Vol. (cu. ft.)	Temp. (° F.)	Cooled by
Fruit and vegetables	2,008	40	unit cooler
Handling room	665	40	unit cooler
Dairy products	415	35	unit cooler
Meat	1,642	15	pipe coils
Fish	350	15	pipe coils

The arrangement and piping of the system starts from two marine compressors mounted with their condensers and liquid receivers on a single base.

All piping, equipment, and valves around the duplex condensing unit and within each control cabinet are factory-assembled and tested, reducing by hundreds of manhours the work at the shipyards required in assembling, hanging, silver soldering, fitting, testing, checking, and handling.

Because of the mass-scale production, it was necessary that condensing



CMT-95F DUPLEX MARINE CONDENSING UNIT

units, control cabinets, and evaporators be arranged in the same manner, with similar bolting and piping connections.

Piping from the condensing unit to the control cabinets is done at the shipyards, and consists of two suction mains, two liquid mains, and one hot gas main for defrosting the meat room coils.

All hand valves, expansion valves, pressure regulators, thermostats, dial thermometers and strainers, complete with interconnecting piping and in-

sulation, are located in the factory-assembled control cabinets.

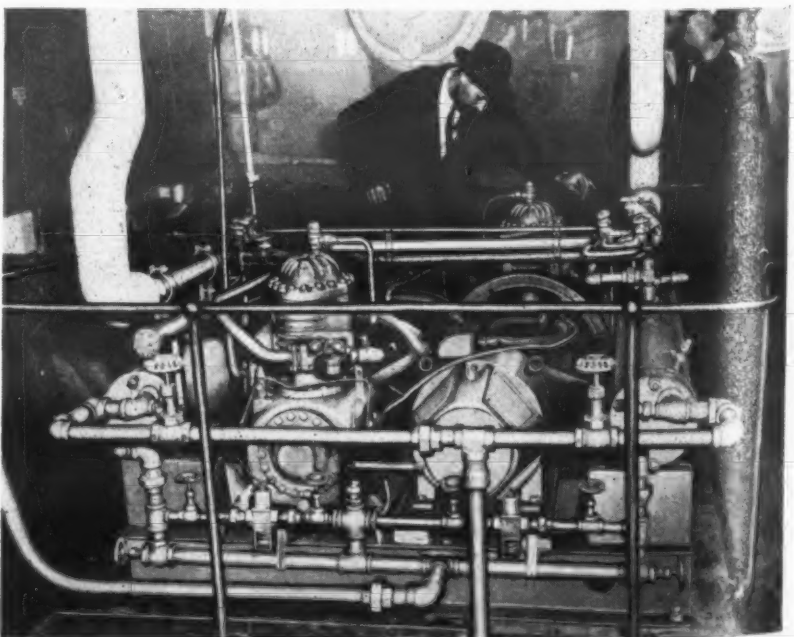
To these the shipyards have only to connect branch lines from the suction and liquid mains, feed lines to the evaporators, and suction return lines from the evaporators. The evaporators, three unit coolers and two pipe-coil systems, come completely assembled from the factory.

The condensing units were developed by Carrier, G-E, and York engineers working together after their

Layout of the refrigerated spaces in the Victory Ship. Pipe coils are used in the two low-temperature rooms, cooling units in the other three.



These four control panels, grouped as shown in the diagram on page 17, were assembled and tested at the factory, installed at the shipyard. Overall dimensions for each: 24 in. x 24 in. x 6 in.

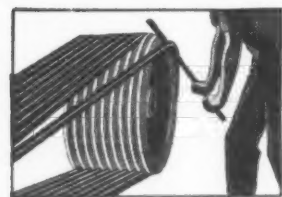


The two marine compressors, mounted with their condensers and liquid receivers on one base, are interchangeable in an emergency. Both are two-cylindrical, vertical, air-cooled, powered by 7½-hp. motors.

## How to Lengthen V-Belt Life—

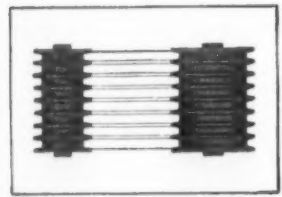
### ON ALL REFRIGERATION AND AIR-CONDITIONING SYSTEMS

You never need to "baby" your tough, firm-gripping Dayton V-Belts, but if you will give them just reasonable care you can add months and years to their remarkably long lives. With the vast increase in the use of Dayton V-Belt Drives for compressors and fans in commercial, industrial and military service, proper maintenance becomes more than ever a patriotic duty. Here are 9 helpful hints:

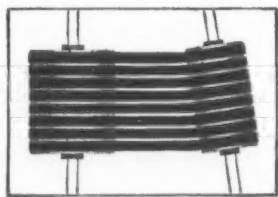


1. When installing, don't pry V-Belts over pulley grooves—instead, slide motor forward and drop belts over the pulleys. Then move motor back until the proper tension is obtained.

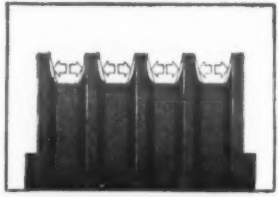
2. When the proper tension is reached, belts have "live springy vibration." When too much slack exists, belts feel dead when struck by hand.



3. Check and line up pulleys, groove for groove, and in parallel. Misalignment wears both belts and pulley grooves excessively.



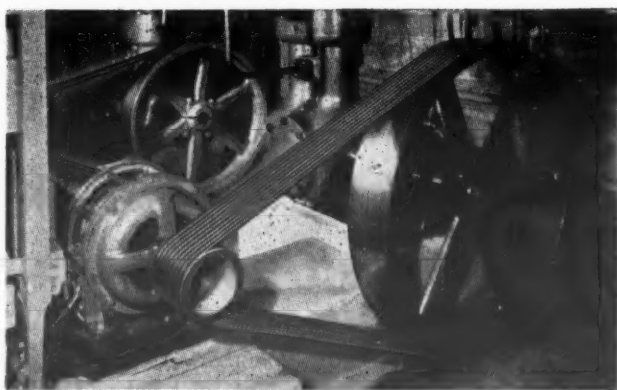
4. Check both shafts for parallel alignment so each belt can pull its share of the load.



5. Check and replace worn pulleys—they wear out belts prematurely.

6. Don't replace a part of a set of V-Belts with new belts as the new belts will hog the load and wear out quickly. Instead, replace the whole set and conserve any good belts from the old set for spares.

7. Don't let oil leak on V-Belts. Where an oily condition prevails, use the Dayton Oil-proof V-Belt.



8. Don't hang V-Belts on nails, hooks or across boards or other objects which might cause them to bend sharply.

9. Belts not in use should be stored in a cool, dry place away from direct sunlight and

high temperatures.

You are invited to call on your nearest Dayton Distributor for helpful suggestions or service. He will gladly help you with your V-Belt problems.

THE DAYTON RUBBER MFG. CO., DAYTON 1, OHIO  
Co-Operators of a Government Synthetic Rubber Plant  
DAYTON RUBBER EXPORT CORPORATION  
38 Pearl Street, New York, N. Y., U. S. A. Cable Address: WIDBLOCO

V-Belts by

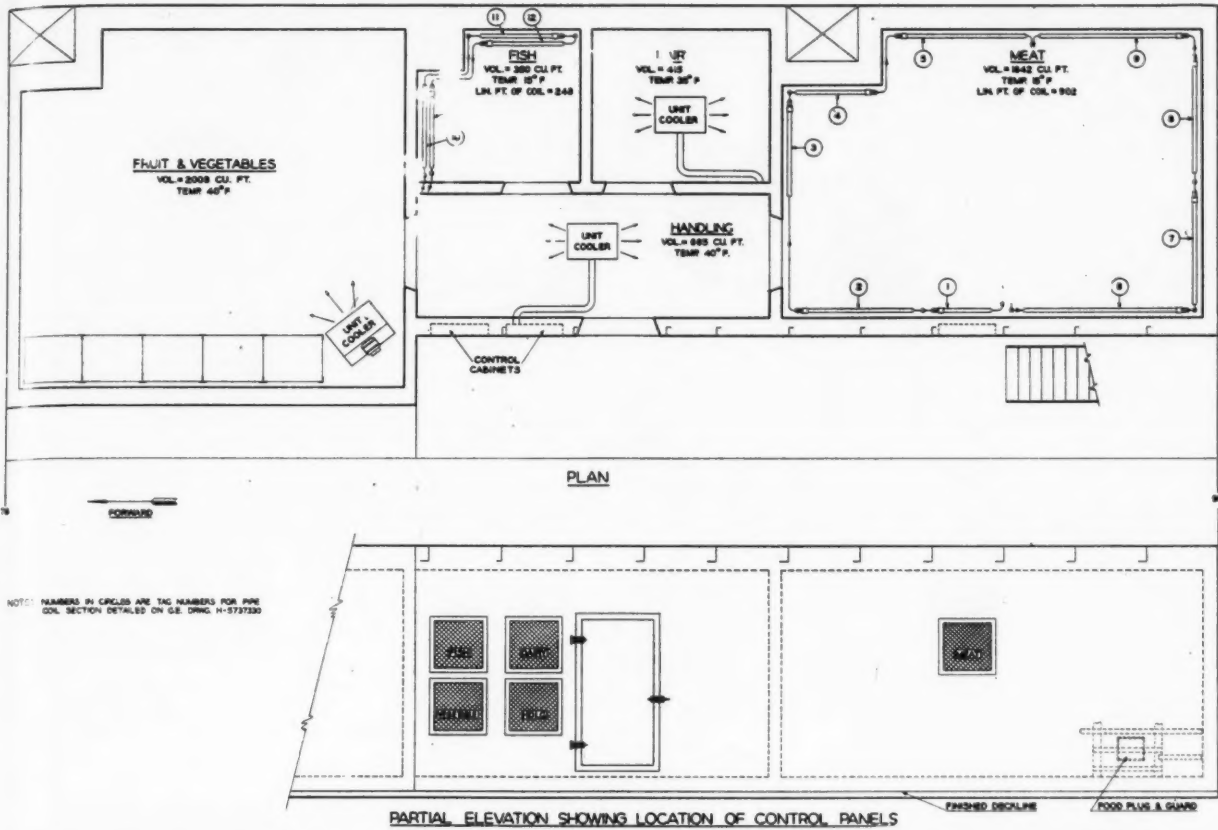
**Dayton Rubber**

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WRITE FOR  
FREE WALL CHART



## Unusual Features Mark Victory Ship Installation



One compressor-condenser-receiver combination controls temperatures in the meat and fish rooms, the second combination serves the other three, but in an emergency either one will handle the entire load.

## Cooperative Design Marks Victory Ships

(Continued from Page 16, Column 3) appointment by the Maritime Commission to supply the fleet's refrigeration equipment.

The duplex unit they produced comprises two separate high-side assemblies each consisting of compressor, condenser, receiver, interchanger, dehydrator, pressure control, water regulator, pressure gages, thermometers, relief valves and necessary piping, and valves and fittings for liquid, suction, condenser water, hot gas defrosting, and atmospheric relief, all mounted on a common structural steel base.

The compressors used are the two-cylinder, vertical, air-cooled type, with piston displacements of 51,000 cu. in. per minute for one compressor and 35,000 cu. in. for the other. Their motors are rated at 7½ hp. each.

The condensers, designed in accordance with the Maritime Commission's specifications, each have 35 sq. ft. of condensing surface. The refrigerant is "Freon-12."

Each compressor-condenser-receiver combination is separate from the other, but valved cross connections on the suction and liquid lines allow either combination to replace the other when necessary.

Normally, one combination handles the high-temperature rooms for handling space, fruit and vegetables, and dairy products. The other feeds the low-temperature rooms containing meat and fish.

The speed of the high-temperature compressor can be increased by changing the motor pulley, so that in an emergency either compressor can be used to handle the entire load.

Another unusual feature is the arrangement of the refrigerant atmospheric-relief piping. The conventional hand-operated emergency overboard dump valve, the engineers believed, is vulnerable to unnecessary loss of refrigerant and to overload pressures in case of fire.

To counteract this are a rupture disc and a relief valve, with an outlet piped topside, to relieve pressures in excess of 300 lbs. and to reclose automatically when pressure returns to normal.

Operating valves, thermometers and gages are located to require a minimum of movement by the operator, and all parts that might require maintenance are readily accessible.

Location of condenser-water inlet and outlet connections and of refrigerant suction, liquid, and hot gas connections are in the same place on all units, with necessary interconnections completed at the factory.

There are five control cabinets, each one housing all the controls and valving for the pipe coils or the unit cooler in the refrigerated compartment. They are flush mounted on the insulated bulkhead.

Here again, through factory assembly, considerable labor is saved at the yards. The consecutive efforts of many factory sections are re-

quired in the production of these units.

At G-E's Bloomfield plant, for example, orders for the parts originate with the industrial, marine, and contractor sales section, working with the ship designers. Design engineering and the drafting room then reproduce the units on paper.

Manufacture is initiated by the air conditioning production staff, the order and stores, and planning and costs sections. Brazing fixtures, drill jigs, and forming tools are made in the tool room.

Parts for the cabinets are cut and formed in the sheet metal section, welders sew the metal parts together, and various other machine sections follow through with the necessary drilling and cutting operations.

The cabinets are assembled and tested in the assembly department, cleared through inspection, transportation, and shipping, while the commercial engineering and advertising sections produce instruction books to facilitate work at the shipyards. There representatives of all three companies' field engineering staffs help with actual installation.

The cabinets are arranged for flush mounting with a 2-in. flange drilled and gasketed for structural unity with the bulkhead. All cabinets have the same overall dimensions—24 in. x 24 in. x 6 in.

Refrigerant lines are brought out through the rear panel, sealed at the outlet point for structural integrity. The capillary tubes of the dial thermometer and thermostat pass through stuffing boxes so arranged that the bulbs may be replaced easily.

Electrical wiring for the thermostat and solenoid valves is provided with a conduit connection at the base of the cabinet. Expansion valve bulbs are fitted into wells attached to the suction lines within the cabinet.

The finished cabinets are essentially the same. Only noticeable differences are the defrosting valves and dual refrigerant circuit controls for the meat room controls, and the suction pressure regulators and gages mounted for the high-temperature rooms control panels.

The earlier Liberty Ships were equipped with wooden protective linings and supports bolted to structural frames. The Victory Ships have steel sheets welded to channel frames supported on laminated phenolic blocks, which are bolted to structural frames and to the deck.

This method entirely insulates the lining from the steel structure of the ship and reduces heat conduction from outside as well as low-temperature losses from within. The completed installation presents a locked, tamper-proof enclosure.

Each of the three manufacturers supplies complete system equipment, including piping, fittings, spares, and refrigerant. The packing and marking of the crates is standardized so that, no matter from which manufacturer it comes, each crate bearing a given number contains the same equipment.

Close observation during the trial run of the first vessels confirmed the success of the application of this

refrigerating system in a large-scale production program.

It is now being applied to smaller cargo ships and to a new type of combat vessel still in the making.

## Wilbur Jones Leaves WPB To Rejoin Bendix

SOUTH BEND, Ind. — Wilbur C. Jones has rejoined the advertising department of Bendix Home Appliances, Inc., where he will assist Walter J. Daily, advertising director. Mr. Jones returns to South Bend after serving two and one-half years with the War Production Board in Washington as a branch chief.

Mr. Jones started in the appliance business under Walter Daily in 1930 with General Electric's refrigeration department.

## The War Against Infection

SOMEWHERE IN INDIA—Installation of York self-contained air conditioning units in British military hospitals in India is successfully combatting the dangers of perspiration-borne infection in open wounds of American and British soldiers convalescing in the excessively humid climate of India.

Improved condition of the air, which normally reaches temperatures of 110° F. and higher with relative humidity at 80% or more, has also speeded up the general recovery of wounded soldiers, it is said.

WHEN PEACE COMES

# KOCH

WILL AGAIN PRODUCE COMMERCIAL REFRIGERATOR EQUIPMENT FOR CIVILIAN USE

**NOW** SOME SELF-CONTAINED REACH-IN REFRIGERATORS ARE AVAILABLE FOR THOSE WHO CAN QUALIFY . . . . .

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**K O C H REFRIGERATORS**  
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# when you *Sell Servel*\*

When you take on the Servel line of Condensing Units, you can be sure that you've got a line that will stick with you . . . one that will offer increasing opportunities for volume and profits.

One reason for this, of course, is the record for dependability and service established by Servel units over the past twenty years. A man who buys a Servel unit is seldom content with any other make for future jobs. Every customer becomes a steady source, not only of repeat business, but of new leads.

In addition to offering you a complete line of units for every cooling need, Servel is constantly on the alert, in the laboratory and in the field, to develop new models as new needs arise, and to improve present models as new techniques are developed. So your line is not only complete, it's always up-to-date in every respect.

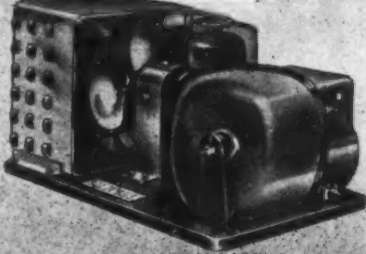
But that's not all. Besides supplying you with new equipment to keep you in the forefront of

new fields, Servel helps develop and broaden your present markets. A trained staff of sales, engineering, and advertising experts is constantly at work, independently, and with dealers, distributors, and fixture manufacturers, finding new leads, developing new uses, helping plan profitable sales programs.

You make a real profit on every sale, too. Servel's discounts are liberal, allow ample margins for service, engineering and selling. Service and selling costs are lower, thanks to Servel's sturdy dependability, and the nation-wide acceptance of the Servel name. Your profits are protected from "loss-leader" competition, because Servel sells only to regularly franchised dealers, and to responsible private brand manufacturers.

Get full information about opportunities for a Servel franchise in your district today. Write Servel, Inc., Evansville 20, Indiana.

\*Servel condensing units serve dealers and fixture manufacturers in every vital field:



1. Store Fixtures
2. Milk Coolers
3. Home Lockers
4. Beverage Coolers
5. Vending Machines
6. Room Coolers
7. Farm Freezers
8. Water Coolers
9. Industrial Cooling
10. Vehicle Refrigeration

# SERVEL, Inc.

ELECTRIC REFRIGERATION AND  
AIR CONDITIONING DIVISION  
Evansville 20, Ind.



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F. M. COCKRELL, Founder

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## Engineering Knottier Than Ever

WAR always creates more problems than it solves. This aphorism even holds true in the refrigeration and air conditioning engineering field, despite the tremendous strides the engineering laboratories and the alley-shop inventors have taken under the stimulus of war needs during the last three years.

We have never known a time when so many engineering problems confronted the industry's engineers, when so many inquiries on such problems have come to our attention, or when so many engineers have been asking us to put them in touch with other engineers who might be working on the same problems.

The most interesting category of all such problems is that of refrigeration and air conditioning applications for the treatment of disease and battle injuries. Scattered all over the world there are refrigeration technicians at work on makeshift apparatus for refrigerated anesthesia, for fever control, for cancer control, for tropical disease treatment, for treatment of allergies, for lung and throat assuagement, and for the prevention of post-operative infection.

In the battle zones the Army's refrigeration engineers are teaming up with the Army's surgeons and Medical Corpsmen to work out new techniques which are sure to bring revolutionary advances in the art of relieving human suffering. And they are calling on engineers back home for help.

Somewhat akin to these researches are the studies being made of the effect air conditioning has on human beings—such as the shock result of entering and leaving conditioned space, and the evaluation of the physiological effects of air conditioning particularly with reference to its inducing, arresting, or preventing various illnesses.

As a corollary of such studies there are the data being taken on the results in terms of worker efficiency obtained in the war plants which are necessarily (because of the processes involved) air conditioned. These studies will bear fruit later in terms of sales to plants which do not need air conditioning in their industrial processing.

Disease control through dust and germ elimination presents many problems intriguing to the air conditioning engineer, and some preliminary advances lead enthusiasts to predict that even the common cold may be held in check eventually through air conditioning.

Toward this end the engineers are considering the relationship of humidity and dust concentration in the air. They know that dust suspension is largely accomplished by electrostatic charge, that germs are carried on dust, and that the charge tends to be dissipated in high humidities.

They are also exploring the effect of particle charge on the efficiency of viscous filters, and trying to find some answer to the difficulty of removing electrically charged dust particles from the air. This is leading to a demand for work on standard filter efficiency ratings, a job yet to be undertaken by the industry.

Air conditioning installed to facilitate industrial processing for war has led to new problems of odor control. So engineers are examining the factors which influence the generation and control of odors in conditioned spaces, particularly in the comparison of adsorption with dilution as means of odor eradication.

This, along with a number of other projects, is leading to a demand for the development of new instruments for the measurement of air velocity, temperature, radiant effects, humidity, etc. The arrival of extreme low-temperature applications has accelerated the demand for better instruments.

Data on the performance of cooling towers and dehumidifiers are said to be inadequate, and so search must go on for new light on spray density and pressure, spray arrangements, and efficiency measurements. Stroboscopic investigations of "drop size" may lead to new ideas on tower design which could easily upset all our theories.

Use of intercoolers and other heat transfer equipment on our new high-altitude aircraft has led to a whole series of questions on heat transfer methods. For example: what can be learned about heat transfer air film coefficients for heat exchangers? Wanted are new comparisons of heat transfer by means of heating, dry cooling, and cooling with condensation.

Engineers need to know more about the effect of shape and dimensions on heat transfer from fin tubing; they want to know the effect of condensation on air resistance, and the factors influencing carry-over velocity for horizontal and vertical air flow.

Questions on the heat transfer of refrigerants are also furrowing brows. High on the list are studies of the heat transfer of evaporating and condensing "Freon" on tubes. Design of new equipment will hinge on results of these studies, and some designing is being held up until more complete answers are obtainable.

Another heat transfer problem is that of moisture diffusion through hygroscopic materials. Engineers want to know the relative effects of diffusion according to vapor pressure difference in relation to reverse travel due to

## They'll Do It Every Time . . . . . By Jimmie Hatlo



hygroscopic action for different hygroscopic materials. Included in these tests will be data on moisture migration in hygroscopic materials with surface seals, and the limiting temperatures and humidities at which condensation begins.

Use of our equipment in so many parts of the globe has led to a demand from Army engineers for new data on heat transmission through walls. Existing data presumes that the walls will be dry; whereas in many climates the walls are moist most of the time.

In addition, military and naval installations underground have led to a whole series of new problems which are yet to be solved by air conditioning engineers.

All such research has a direct bearing on winning the war; yet it will lead to new peacetime triumphs of the industry. The News will do its part in reporting the results of research wherever found, correlating and comparing the findings of the various workers, and keeping them in touch with one another while their research is still in progress.

Army and Navy requirements have also led to most interesting new developments in portability. Refrigeration used to be talked of exclusively in terms of installations, signifying its stationary nature. But the war has put a total emphasis on mobility.

These studies will lead to water coolers and refrigerators for airplanes, automobiles, trucks, and buses. They could lead to lightweight, 1 or 1½ cu. ft. portable refrigerators for hotels and apartments, trailers and tourist camps—in all of which places the ability to move a refrigerator easily and quickly would be appreciated.

Truck refrigeration will be greatly advanced by current war research, and everybody knows that these phases of refrigeration engineering will be in the spotlight in the years to come, when so much of our foodstuffs may be transported in frozen state. Mobile quick-freezing units, which will follow the crops, can also be expected.

All this low-temperature work is placing new demands on insulation, on moisture resistance, and on new insulating materials—running the course from micro-fibers to laminated steel plates. The plastics field will produce many surprises for us, and when fully developed, plastics may revolutionize refrigerator cabinet design.

One truly basic problem relates to the fact that while high sides have been getting smaller and smaller (and

at the same time more efficient), low sides have changed hardly at all. Some engineers are wondering if evaporator size can't be reduced, too, with good results. Here is a major project.

New problems are coming up in connection with the freezing of foods, and with the changes that take place in frozen foods while in storage. Such problems include the rate of freezing through foods, heat transfer by conductivity through frozen food packages, and optimum freezing problems.

For example, how do optimum storage conditions change with the length of the storage? Obviously temperatures required for three-months storage are different from those required for 24-months storage. What's needed is a table for different foods, different lengths of storage, and different climates.

One subject which continually plagues the refrigeration and air conditioning engineer is the twin problem of sound and vibration. Particularly as applied to refrigeration machinery and air-moving equipment, much needs to be done toward reducing sound and vibration at their sources, and toward eliminating their transmission.

Radiant heating is a most intriguing field for the air conditioning engineer. For maximum human comfort, should radiant heating be installed in the floor, ceiling, or walls? And what is the comparative efficiency and psychological effect of large low-temperature heat sources as matched against smaller high-temperature sources?

Reversed refrigeration cycle also has remarkable possibilities, but again much development work must be done. In this connection, all air conditioning engineers complain that present houses are poor thermal structures. They believe that if the same critical engineering attention which produced the present highly efficient household refrigerator cabinet were applied to reducing the heat losses in houses, the air conditioning equipment problem would be greatly simplified.

Our stock pile of fundamental knowledge is being used up at a much faster rate than it is being replenished by research in the universities and the industrial laboratories. Much of the intensive engineering and scientific work carried on for the war is confined to development and application. It is even now conceded that new "raw material" is needed. "Raw material" in this case consists of the findings of pure research.



## Selective Service Officials Describe Status of Refrigeration Employees

Prepared expressly for Air Conditioning & Refrigeration News by  
National Headquarters, Selective Service System,  
under the direction of Lt. Col K. D. Pulcifer

WASHINGTON. — The military drain on the nation's industrial manpower is dwindling. The Army has reached peak strength. The Navy, based on an upward revision of peak strength announced last week, needs about 190,000 more men this year, plus replacements. Thus, for the first time since Pearl Harbor, the requirements of the Armed Forces are comparatively stabilized.

America's rapid mobilization of a military force of more than 11,000,000 men, the great majority of whom were inducted through the Selective Service System, is one of the major accomplishments in history. That it was achieved without seriously disrupting war production is a still greater accomplishment.

Having reached peak strengths, the needs of the Army and Navy for the balance of this year, at least, will be confined largely to combat casualty replacements. Young men are needed for such replacements. Older men, less active physically and more valuable in key industrial jobs, may be deferred indefinitely, especially those over 30 years of age.

Specifically, what is the situation in the refrigeration industry? The production and repair of refrigeration machinery always have been included in the List of Essential Activities promulgated by the War Relocation Commission and used as a guide by Selective Service Local Boards in determining occupational essentiality.

### WHAT PRESENT RULES ARE

Men over 30 regularly engaged in the refrigeration business, even though not in key jobs, will continue to be eligible for deferment. Men 26 to 29, inclusive, will be eligible for deferment if they are determined to be "necessary to and regularly engaged in" the refrigeration business. But men under 26 due to the urgency for young, physically fit men for combat replacements are prohibited from receiving occupational deferment except in a limited number of unusually critical occupations, not including refrigeration.

Industry has been accorded rather liberal treatment in the deferment of men whose primary responsibility is to serve their country in time of war, if physically qualified. Local Boards have been most careful to investigate each registrant's qualifications in the light of the nation's military needs.

Registrants therefore have been placed in Class II-A or Class II-B (occupational deferment classifications) only after it has been clearly established that their usefulness in civilian occupations is greater than that in the Armed Forces.

### CURRENT DEMANDS OUTLINED

Current demands of the Armed Forces for young men, preferably in the 18-26 age group, prompted action several months ago cancelling occupational deferments of all registrants in the 18-26 age group except those in activities recommended to Selective Service by the Inter-Agency Committee on Occupational Deferments. This committee is composed principally of Federal Government agencies having responsibility for all war material requirements.

This list of such activities constitutes the only list in which registrants are considered as exceptions to the general restriction against the occupational deferment of registrants under the age of 26.

Of course, many young men now deferred will be found upon examination to be physically unacceptable to the armed forces and will not be inducted. In addition to these men disqualified for military service, over-age men, the physically handicapped, returned soldiers, and the women of the nation must be used more effectively to replace able-bodied young men in industry and agriculture.

Far too many employers have been slow to accept a prospective manpower shortage and to realize that young able-bodied men must be replaced by other workers. The training of these substitute workers lagged.

third, older men with more experience, skill, and stability are better fitted to carry on necessary civilian activities.

In the application of this pattern, boys arriving at the age of 18 play an important part. There are about 3,000 boys becoming 18 each day—nearly 100,000 per month. The number available for military induction must be reduced by those physically unfit for general military service, those deferred for agricultural work under the provisions of the Tydings Amendment, and those already enlisted in the Navy (which accepts 17 year-olds), and in Army Reserve units.

So far as can be determined now, present Selective Service policies governing occupational deferment will meet the demands of the future. The use of the over 30 year-old group

would not seem necessary in the near future. The use of the 26-29-year olds should be necessary for the present only where men are in jobs of lesser essentiality. But the final answer rests, of course, entirely on the future developments of the war and the further need for manpower.

So much for yesterday and for today. What about tomorrow? So long as there is a need for men to increase, to maintain, or to replace personnel in the Army or the Navy, Selective Service must continue to draft men. So long as any veteran seeks his old job after his demobilization or a new job that cannot be found elsewhere, Selective Service has Congressional mandate to give every aid to this veteran.

"So long as Selective Service has the custody of the greatest inventory of manpower America has ever made,

it must be the responsibility of Selective Service to aid to the maximum in understanding the reasons for the mental and physical disabilities of millions of our men," said Major General Lewis B. Hershey, Selective Service Director recently. "Once having understood, Selective Service will collaborate in every possible way to insure that by training and rehabilitation, more men can assume the entire burden of citizenship."

"Victory is not here but it will come," he continued. "Never again must we lose peace because our citizenry is not prepared to provide national security. If we are to have a democracy, some service must be required of each of our citizens and required early, for we protect in life that to which we have given birth."



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# Unusual Type of System Is Used To 'Pull Down' Supercharger Test Room

## Air 'Works' In Refrigeration Turbines To Obtain Extremely Low Temperatures

BLOOMFIELD, N. J. — The turbo-supercharger — the metal "lung" which has placed America's biggest bombers and deadliest fighters on top of the enemy—is a device which operates under almost incredible extremes of temperature and speed. Its turbine may glow brilliantly at 1700° F., while only a few inches away on the same shaft, its compressor is inhaling the frigid, rarified atmosphere of the sub-stratosphere at -100° F. The speed of the rotating turbine buckets exceeds the normal velocity of sound; the velocity of the impeller rim exceeds that of a rifle bullet. Fifty caliber bullets fired at superchargers have penetrated the casings, only to bounce off the rotating parts without seriously interfering with their operation.

### WHY TESTING IS NECESSARY

The magnitude of the forces involved stresses all parts close to their ultimate limit. Therefore they must not only be carefully designed and built, but must be tested with extreme care under all the conditions which they will encounter in actual flight. To achieve this, General Electric engineers went right back to fundamentals in devising the earth-bound testing equipment.

In duplicating high altitude conditions, it was not sufficient just to cool and evacuate the atmosphere within a test chamber. There are many different tests, requiring a constant supply of air under closely controlled conditions.

In one test, exact flying conditions must be maintained. Combustion air to be fed to an airplane motor through the supercharger is maintained at the temperature and pressure encountered at various altitudes miles above the earth.

The temperature of the air can be held at any level down to -100° F. The pressure at which the air is delivered can be controlled to equal

the sum of the altitude static pressure and the air scoop ram pressure for a particular forward speed of the plane.

Refrigeration of the air is accomplished by the cycle shown in the schematic diagram. Normal sea level air is compressed by single-stage geared compressors to approximately 22 lbs. per sq. in. gage. First it is cooled from 300° F. to approximately 90° F. by means of finned air-to-water cooling coils.

### REFRIGERATION STEPS

A bank of direct expansion "Freon" coils reduces the temperature of the air further to approximately 49° F. During the summer time when the moisture content of the outside air is high, a large proportion of the moisture in the incoming air is condensed in this cooling process and is removed by means of moisture eliminators.

A second bank of "Freon" coils reduces the air temperature to approximately 26° F. At this temperature frosting would interfere with continuous operation; therefore, the entire coil surface is flooded with a non-frosting solution. Thus the moisture that would normally remain on the coil surface in the form of frost is absorbed into the continuously recirculated preventive solution. To maintain a constant solution strength a small quantity is automatically withdrawn, passed through an evaporative concentrator and reintroduced into the cycle.

A third bank of "Freon" coils reduces the temperature to approximately 5° F., with a similar system for prevention of frosting. The third bank of coils is followed by a moisture eliminator to decrease the carry-over to as low a value as possible. Refrigeration for the three banks of "Freon" coils is provided by 6 G-E 60-h.p. condensing units.

At this point the G-E engineers went back to fundamentals and made

the air "work" to carry the temperature on down to as low as -100° F. The air at 5° F. and approximately 20 lbs. per sq. in. gage pressure is expanded through specially constructed refrigeration turbines to the altitude pressure maintained in the test cell. The energy removed from the air by the refrigeration turbine is absorbed by a standard supercharger compressor.

By varying the load on this compressor, the temperature of the air delivered to the test cell can be varied to meet any needs. The capacities for which the system was designed are as follows: 1,200 lbs. of air per minute at -30° F. at sea level pressure; 1,200 lbs. of air per minute at -100° F. at pressures equivalent to altitudes of 30,000 feet and above.

To obtain altitude conditions, the cell is exhausted by means of steam ejectors, which operate over a very wide range, simply giving lower weight flows as the altitude increases. The ejectors for this power plant test cell can exhaust 3,000 lbs. of air per minute at conditions equivalent to 20,000 feet altitude and 450 lbs. of air per minute at 50,000 ft. altitude.

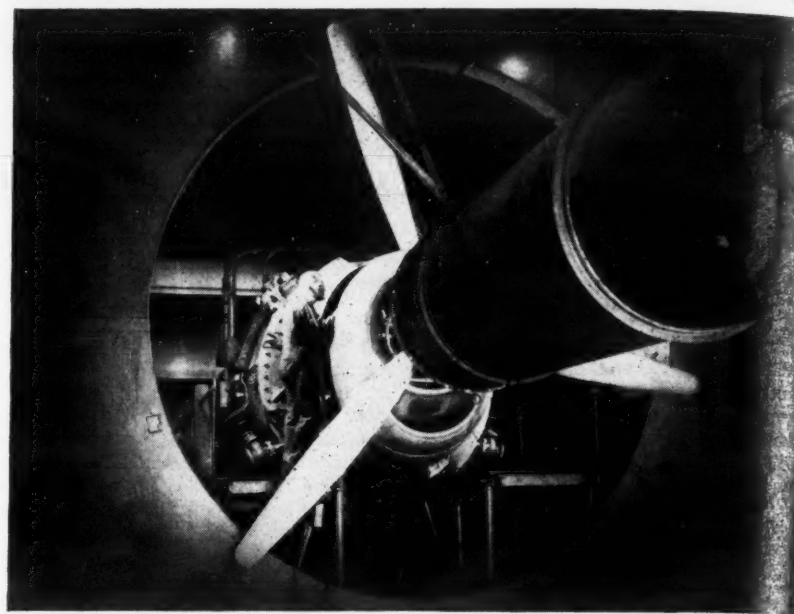
### Crosley Appoints Texas Firm

AMARILLO, Tex. — Southwestern Electrical Appliance Co. has been appointed distributor for The Crosley Corp. in northwestern Texas.

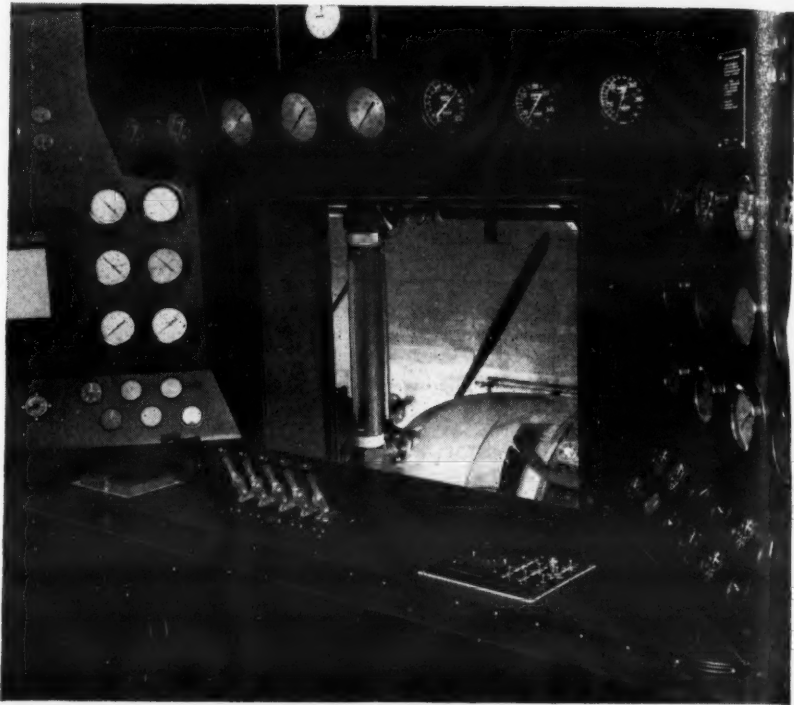
The Southwestern Electrical Appliance Co. is owned by Harvey Southworth who started in business in 1935 and has built up a business with an annual sales volume of approximately \$1,000,000. Other partners in the firm are Glenn Frazier and Robert Lewis.

### New Service Shop In Fresno

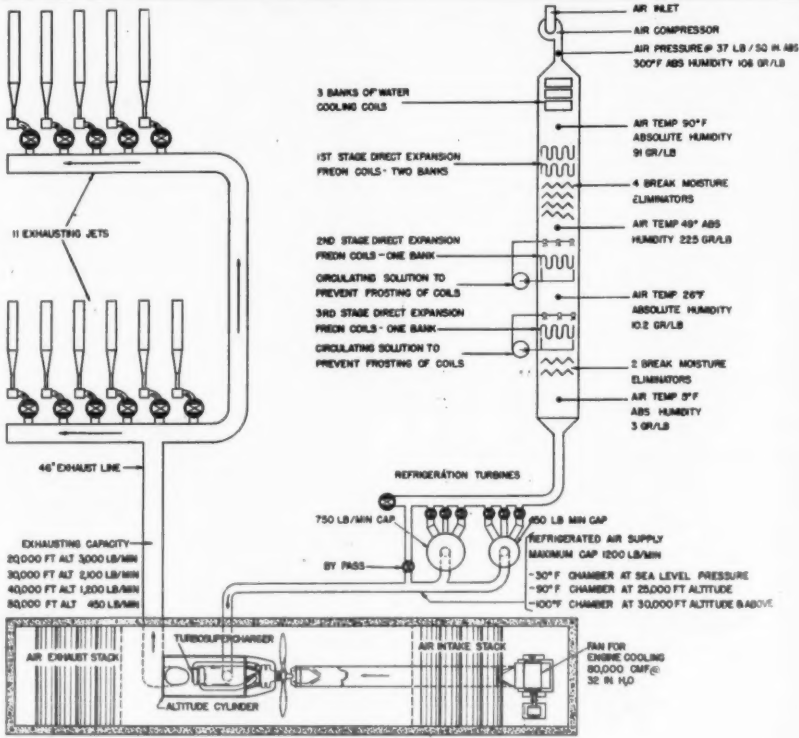
FRESNO, Calif. — Refrigeration Service & Equipment Co., is the firm name under which R. F. Cates has published a certificate that he is conducting business at 302 North Fresno St., Fresno, Calif.



Power plant test cell for the turbo-supercharger, the metal "lung" which gets our aircraft "over" the enemy.

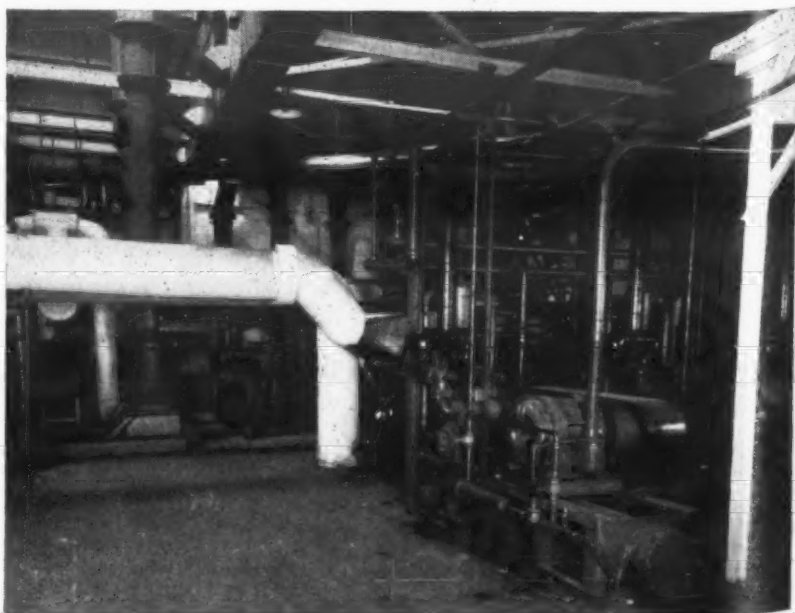


Control board for the airplane power plant test stand. View is into cell.



ENGINE TEST STAND WITH ALTITUDE CYLINDER

Diagrammatic sketch of the equipment by which correct altitude and temperature conditions are obtained in the "earthbound" test cell. Preliminary cooling is done by three stages of direct expansion cooling, with the final lowering of temperatures done by the refrigeration turbine system.



Some of the refrigerating and exhausting equipment that is used.

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... but just in time

### THE RECALIBRATOR

That "Recalibrator" is one of the most important advances ever made in gauge design. It's the first completely sound way to correct a gauge that has been knocked out of adjustment.

Fortunately the "Recalibrator" was ready and waiting when wartime conditions demanded harder, more dependable service from gauges and dial thermometers.

If a "Recalibrator" gauge is knocked out of adjustment, the twist of a screwdriver wipes out the error in just a few seconds. It makes the gauge accurate again at all points on the scale—something that has never been satisfactorily accomplished before. For gauges you can keep completely accurate, always look for the "Recalibrator"—the finishing touch to a fine gauge.

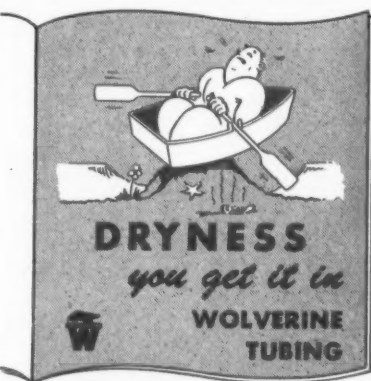
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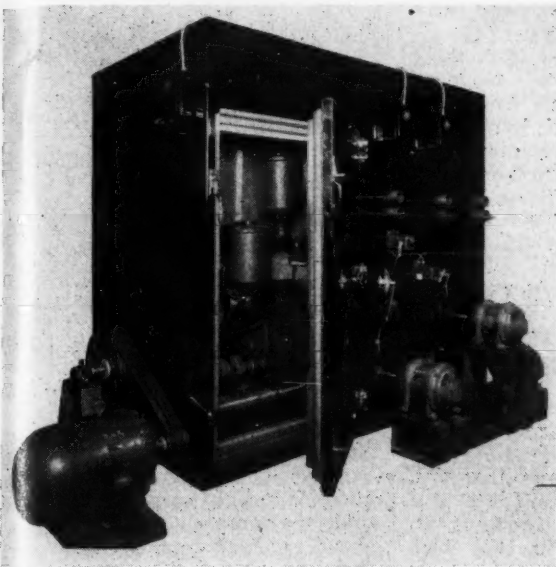
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The "Recalibrator" is available in all Marsh Gauges, standard in all Marsh Dial Thermometers. It is typical of the advanced design you'll find throughout the broad Marsh line — all products of 75 years of specialization.



## This Chamber Permits Cold Tests In Vacuum



Built for the Sperry Gyroscope Co. and General Motors, this special American Coils chamber can simulate flying conditions by reducing the temperature and interior air pressure. Cooling is provided by a mixture of alcohol and dry ice, close temperature control being provided by balancing refrigerating effect with heat.

## Pre-Flight Test of Aircraft Instruments Made Possible By Special Cold Chamber

NEWARK, N. J.—In the latter part of 1941, when it seemed certain that United States would be drawn into the war, American Coils Co., comparatively new manufacturer of refrigeration coils, applied its "know-how" of cooling to the development and production of low temperature chambers for the testing of aircraft instruments under conditions similar to actual flying service.

So successful was the design that some 200 test chambers were produced for the Army, Navy, and several aircraft instrument makers and users.

The first chamber made by American Coils employed a solid CO<sub>2</sub> (dry ice) and alcohol mixture to produce temperatures as low as -65° C. Later models were powered by two and three-stage "Freon-22" units operating on a continuous cycle from 70° C. down to -70° C. with relative humidities ranging from 20% to 95%. These later models were extensively used in production tests.

Original dry ice test chamber, which had a capacity of 11 cu. ft., was controlled to within plus or minus two degrees by introducing heat into the chamber to balance cooling effect of the dry ice. Dry ice was loaded from the top into a tank, and then alcohol was also placed in the tank.

An extended surface coil mounted on the bottom of this tank was so arranged that the alcohol circulated into the coil by gravity. Air was circulated through the coil and baffled to produce even cooling throughout the testing space. The chamber could be heated to approximately 70° C. to run tests for both heat and cold, but the alcohol had to be removed from the unit before the heat test could be made.

This disadvantage limited its use to laboratory spot testing or production testing where it is not necessary to cycle from hot to cold during the same test run. Chief advantages claimed for the original unit was that the CO<sub>2</sub> vapors did not enter the test chamber itself and the temperature could be dropped from ambient to -60° C. in 30 to 40 minutes.

Demands from instrument manufacturers for a test chamber with a continuous operating range from 70° C. to -70° F. for production testing led to the development of the 25 cu. ft. Model RTC powered by two and three-stage "F-22" machines. A large glass door in the new test

chamber permitted the operator to see any part of the interior, and in some jobs, special hand holes were placed in the door or side of the cabinet so that instruments could be manipulated during test runs. Special holes for wiring and piping were also provided.

In developing this new line American Coils cooperated with the manufacturers of condensing units, expansion valves, controls, and other equipment to perfect the design.

Especially important was the designing of low side that would balance off the compressor as the temperature lowered, because a 15-hp. three-stage condensing unit would have a capacity of about 7 tons at ambient temperature, but less than 1 ton at the lowest temperatures, pointed out Thomas W. Binder, head of American Coils. This fine balancing permitted the use of a 15-hp. unit where, in the usual design, a 40 or 50-hp. condensing unit would be employed, claimed Mr. Binder.

Special cabinets were built also for the Sperry Gyroscope Co. and General Motors to test certain equipment under a vacuum. These chambers employed dry ice as the coolant. Later the RVD line was introduced to provide not only heating and low temperature control, but altitude testing as well. These units, which can simulate flying conditions up to 60,000 ft. altitude, are being used by Eclipse Pioneer, Curtiss Wright, and others.

Experience gained in these low temperature applications has been incorporated in the design of American Coil commercial units, declared Mr. Binder. These include the "Food Conditioner," "Alservice Open-Face Unit," "Zerobreeze," and the "Comfortaire," the latter being described as a "latent heat cooler."

### Export Representatives And Service Engineers

Large domestic and commercial refrigeration manufacturer doing world wide business is interested in interviewing men with good background for both retail and wholesale selling, also servicemen for employment abroad postwar. Write giving full details, experience, and references. Box 1584, Air Conditioning & Refrigeration News.

## Change Assembly Line For Sectional Cooler

MARION, Ohio—Typical of the way in which the refrigeration industry's engineering research and manufacturing "know-how" were combined to produce a product that helps to keep U. S. fighting men properly fed on the way to victory, is Universal Cooler Corp.'s production of a 650 cu. ft. moveable sectional cooler for the Armed Forces.

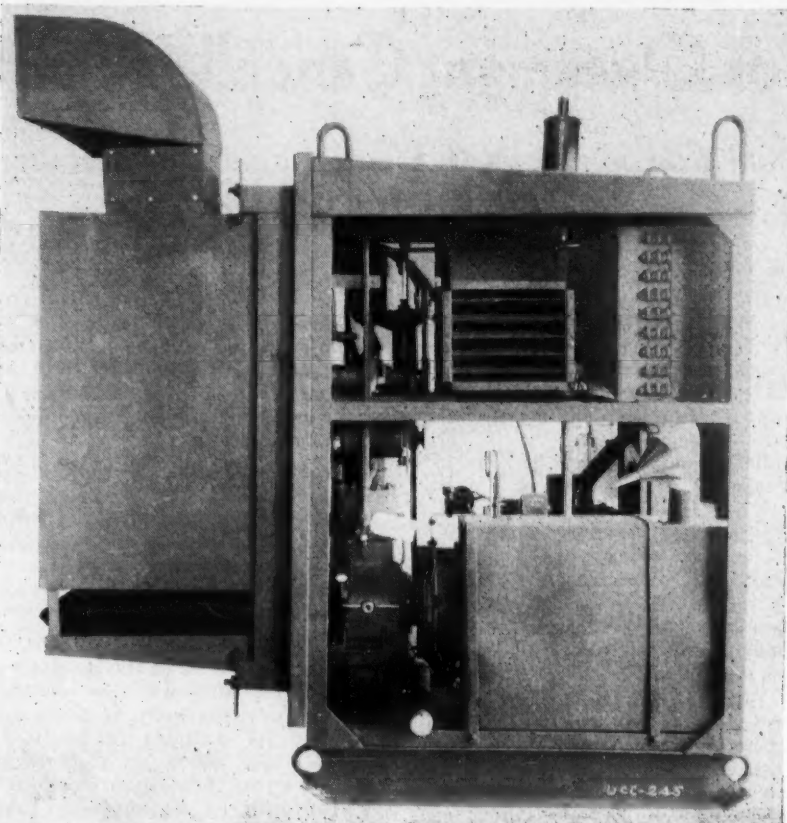
When Universal Cooler got orders to make this unit, the research engineering staff made studies of product and performance requirements, while the factory staff started production of a new assembly line.

As drawings of the component parts came from the board, manufacturing equipment and methods to produce these parts were prepared in readiness for starting the job. Result is a modern automotive-type 330 foot assembly line backed by modern machine tools.

Paint booths were so arranged on the line to offer a completely painted unit by the time it reached the shipping department, where the units were export crated and delivered to the dock for world-wide shipment.

Export packing of these gasoline-powered refrigerators was considerable of a trick. Every unit was wrapped and sealed in moisture-proof paper to protect the mechanism against sea-water and salt-air, and then was completely boxed for export. Spare parts required were packed with tools in the tool box and in addition an extensive list of

## Skid-Mounted Unit Powers Sectional Box



Self-contained gas-engine driven condensing units like this are used to refrigerate Universal Cooler's 650 cu. ft. sectional coolers in which is stored food for the armed forces.

other parts were shipped to many depots for world-wide delivery.

This 650 cu. ft. Armed Forces refrigerator provides temperatures ranging from 35° F. (for perishable foods) to 10° F. (for frozen foods) and may be mounted singularly, or in batteries.

# STRATA-FLO

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## WATER COOLER

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### REVOLUTIONARY ADVANTAGES

1. NO WARM-UP
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5. IMPOSSIBLE FOR WATER TO ENTER REFRIGERANT CIRCUIT

Many model sizes available—with or without cabinets.

### COMPLETE HEAT EXCHANGE LINE

d-h equipment includes scientifically designed units for all industries. Here are typical examples:

**WAT-R-MISER**  
Evaporative coolers with built-in air filters.

**TURBO-FLO**  
For larger capacity than Strata-Flo—for fluids other than water.

**SPASAYER**  
Beautiful horizontal type air coolers for cold rooms and large refrigerators.

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Available for war needs now—for commercial needs in the future—STRATA-FLO brings new efficiency and economy in water cooler operation. Advanced design doubles cold water supply at peak periods—makes possible simplified, non-critical controls—results in trouble-free, dependable operation.

STRATA-FLO models, with or without cabinets, are manufactured in a variety of sizes. Investigate their advantages now—plan on using this newer, better water cooling equipment. Write for complete informational catalog.

## BETTER THAN THE NOSE OF HAL THE HOUND is the LENK HALIDE LEAK DETECTOR



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# Warning: Have Your Company Ready Now For Overnight Cancellation of War Contracts

**Small Companies With Limited Financial Resources Again Face Prospects of Bankruptcy Unless Their Settlement Claims Are Ready**

**Editor's Note:** The overnight termination of wartime manufacturing contracts is going to cut to the very heart of America's industrial activity. It has already happened to a few manufacturers. Within the year to come it will happen to more.

The inevitable impact will be cushioned in every way that government and business can devise. The articles that have been produced, the stock piles acquired, and the commitments legitimately made in anticipation of continued production all will be paid for as fairly and as swiftly as possible.

But by this time next year, in conservative estimate, the line of manufacturers waiting for the settlement of their claims will be discouragingly long. This much you can do now: organize for immediate action when the time comes, with facts and figures and materials ready for a simplified and well-prepared settlement claim.

This article, and three that will follow in succeeding issues of the NEWS, will outline the over-all procedure of termination, and consider its details in the

order of their appearance.

As an analysis, it will primarily help the small business subcontractor who hasn't a staff of experts to read all the statements that Congress and government agencies have issued really to help him.

By authority of recent Congressional action, contracting agencies now can deal directly with subcontractors and suppliers when, for instance, their prime contractor proves unable to meet his obligations.

Good. But that is only a first step. By and large the secondary suppliers, although they constitute the great body of firms affected by contract termination, are pretty much on their own. It is up to themselves, and with little help, to do anything that can be done in the way of preparation.

The first two articles in this series will outline the things to do before contract termination hits you. The second two will follow through with what steps to take when the telegram comes: "Stop work immediately—contract terminated."

## I. Preliminary

### A. Setting Up Your Termination Staff:

Planning for contract termination promises, for most manufacturers, to be a full-time job. Unless your company is small and your war contracts few, don't try to supervise it yourself. Choose an executive familiar with your operating procedure both before and since you began wartime manufacturing.

Give him the authority he will need, and the trained help. The latter should include legal and engineering experts familiar with your production methods. And, from the records department, an accountant equally at home with your methods of keeping track of men, material, and machines.

It will be up to this staff, working along lines laid down by the regulations, schedules, and procurement paper of OPA, SWPC, WPB, and the other procurement agencies that touch your production contracts, to do the research and construction that go into your over-all plan for Termination Day.

### B. Contacting Your Vendors and Your Customers.

Be sure that the people you are

dealing with are fully informed of your termination preparations, and that they are given full opportunity to work along with you and with their own subcontractors.

This step constitutes something more than good ethics. Lack of preparation by the prime contractor at the head of the line will delay contract settlement payments to his vendors. For few manufacturers will be in a position to, or be willing to, pay off their suppliers before their own settlement claims have been paid by the government.

Delay in payment at the top will pass right on down the line to each subcontractor in turn, and the smallest companies at the end, with the least financial reserves, can easily be forced into receivership.

The receiver's legal action against the small company's customer can start a chain of lawsuits that will domino straight back up the line until even the prime contractor is hit.

You are working for your own protection when you help your suppliers through with all the protective planning possible, and work with them in laying out their lines of protection parallel to your own.

Similarly, learn what your customer's termination requirements are going to be. Go over his termination organization before setting up your own, and ask his cooperation wherever it can help.

This applies especially if you have only a few war contractors as customers. The fewer your customers, the more important it is to you that each one of them is well prepared, and that when the time comes you can go ahead with your own plans with some confidence in the directions those above and below you will follow.

## II. Regulations

### A. Procurement Agency Rulings:

Under terms of the First War Powers Act, passed late in 1941, the President was authorized to empower government departments and agencies to terminate war manufacturing contracts. That authority has since been delegated to various procurement agencies.

Use of the standard termination forms issued by these agencies, since the pattern is consistent, will simplify your final settlement procedure. There has been little change in termination forms since their issue.

At present, however, these forms apply only to contracts between the War Department and its prime and subcontractors. Similar forms are being planned for all procurement agencies by the Joint Contract Termination Board.

Termination schools are being set up in the larger war-production centers throughout the country. Locate the one nearest you, and have at least one member of your special staff attend. It will offer some insight into the government's anticipated plans and problems.

### B. Tax Questions.

Taxes are going to affect the manner in which you approach contract termination. Recent tax legislation makes it possible for you to consider alternate methods that will bring in the disposal of excess materials, loss carry-backs and carry-forwards, five-year amortization, last-in-first-out inventories, and others.

Excess materials and equipment, because taxes now probably are much higher than postwar taxes will be, point up the contrast between giving full weight to present deductible losses and carrying over whatever taxable gains can be postponed.

Operating losses, according to the law, may be carried back to the two preceding taxable years, or carried forward to the two years following, to be applied in mitigation of income or excess profits taxes. One of the two will represent a cash saving to you.

Lower postwar taxes also affect the possibilities of accelerating the cost of war facilities toward paying off an amortization in less than five years. There are several alternate procedures open in treating amortizations. Check them.

The impossibility of replacing used merchandise at prices anywhere near original cost figures makes it possible to economize through low-cost inventory. The differences between prewar cost and cost after termination can, under proper procedure, be applied toward tax refund.

These and other tax problems will apply in the termination procedures open to you.

### C. Termination Clauses.

The termination clauses within your contracts deserve special review.

## Topics Covered

### Article I—Before Termination

#### I. Preliminary

- Setting up your termination staff.
- Contacting your vendors and your customers.

#### II. Regulations

- Procurement agency rulings.
- Tax questions.
- Termination clauses.
- Specific protection points.

#### III. Government Loans

- Why they were set up.
- The loans available.
- Termination payments.

Not all contracts contain them, and even those having them sometimes allow alternate procedures. Newer revisions represent improvements toward greater simplicity and definition. Check your contracts against these, and amend or revise your termination clauses accordingly.

The Joint Contract Termination Board, under the general supervision of Bernard Baruch and the chairmanship of John Hancock, was set up to standardize the termination clauses of the various procurement agencies, and the rights of contractors operating under them.

The Board formulated a statement of principles for the determination of costs, and a uniform lump-sum supply contract termination article.

Uniform clauses for use in all fixed-price supply contracts are now on the way. Their issue will simplify the entire procedure. Use of these, in place of other suggested conditions that might prove unfair to either side, will offer greater protection to both contracting parties.

### D. Specific Protection Points.

More common than the omission of protective clauses is the carelessness of not having all commitments in writing. Caution your own departments against making verbal or informal commitments, and don't accept them from others with whom you are dealing.

And they should be in legal form. This security has proved to be equally important. Without these two precautions you at least contribute to misunderstanding, and at most invite greater delays rising out of arbitration, confused settlement claims, and claims for damages against you.

Termination notices must be in writing, and copies sent to the contractor, his assignee, and his guarantor or surety. Draw up these notices, in full legal form, well ahead of time.

A payment bond, guaranteeing your vendors their money upon delivery of the goods to you, is good business procedure. It represents one of several points that pay off in subsequent business contacts.

You have a right to expect the same consideration from your prime contractor. During wartime especially, firms sometimes expand on shoestring capital and find themselves over-extended when hit by unexpected financial demands. Protection against your customer's possible insolvency should always be considered.

A time when an amendment to your contract is being considered is also a time for quick review on your part for the restatement of any terms whose standing has been changed by legislative action, or by revised practices, since the contract was originally drawn up.

Reservations not specifically stated in a contract are apt to be questioned when claimed under contract settlement. The Army's Procurement Regulation No. 15, with its Termination Accounting Manual, is good reference authority. When in doubt, write to the government bureau from which the original contract stems:

War Department—Director of Readjustment Div., Headquarters, Army Service Forces, Pentagon Bldg., Washington, D. C.

Navy Department—Industrial Readjustment Branch, Office of Procurement and Material, Navy Bldg., Washington, D. C.

Maritime Commission—Central Termination Committee, Commerce Bldg., Washington, D. C.

Treasury Department—Director, Procurement Div., Washington, D. C.

## III. Government Loans

### A. Why They Were Created:

A lack of actual cash reserves is contract termination's greatest threat even to a well-ordered, firmly established.

(Concluded on Page 23, Column 1)

## WHERE *Seeing* IS IMPORTANT...



WELL DISPLAYED  
MERCHANDISE IS

*Half-Sold!*

**SPECIFY Thermopane FOR YOUR CASES!**

### 4 important features of Thermopane

- 1 INSULATING AIR SPACE.** The layer of air inside the Thermopane units is scientifically cleaned, dried and hermetically sealed at the factory. This sealed-in air gives Thermopane its high insulating efficiency.
- 2 BOMDERMETIC SEAL.** This patented, weatherproof, metal-to-glass seal bonds the two panes of glass into one unit to prevent dirt and moisture from entering the air space.
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- 4 ONLY TWO SURFACES TO CLEAN.** The glass surfaces inside a unit are specially cleaned at the factory... and stay clean!

Just as gloves and other accessories dear to women's hearts need proper display to push sales curves upward, so must refrigerated food items be given the advantage of visibility. This will be particularly true in the postwar period when merchandise will face stiff competition. Every item in the store will bid for customer attention... every art of display and presentation will be utilized.

This is the problem facing the frozen food and refrigerated food case and cabinet manufacturers. In this field, the war interrupted the decided trend toward "visual" tops and doors. Now manufacturers who are planning their postwar equipment are turning again to THERMOPANE—the insulating glass that provides Clear Vision.

THERMOPANE, fabricated at the factory with multiple panes of glass bonded together with the patented Bomdermetic Seal, is easy and economical to install. Cases made with THERMOPANE are every bit as efficient as the old style "Blind Top" cases, yet they permit the buyer to see what she wants to buy. If you're seeking maximum sales results in your postwar cases and cabinets, be sure to investigate THERMOPANE—the product that puts eyes in your food cases. Libbey-Owens-Ford Glass Co., 6074-B Nicholas Bldg., Toledo 3, Ohio.

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**LIBBEY-OWENS-FORD**  
a Great Name in GLASS



Trade Marks Registered



## Small Firms Urged To Prepare Now For Sudden Termination of War Work

(Concluded from Page 22, Column 5)

lished business. Unencumbered cash outlay will be a specific need in any plan to tide your business over while working capital is tied up pending claims settlement.

Inevitably, the settlement of interrupted manufacturing claims is going to be a tremendous administrative job, even with the machinery completely ready for the job. Cash reserves and liquid funds must be available for the great majority of American business.

The government's chief consideration in closing out war contracts and making settlements, it has said, is to sacrifice financial exactness to speed, in bringing the nation's industry through reconversion and into civilian production.

Thus a system of government loans and funds for advance payments has been set up, to strengthen cash reserves and to retire short-term private debts. Interest payments on these automatically stop when termination occurs.

### B. The Loans Available.

The V loan, issued under authority of Federal Reserve Regulation V, was set up originally as a tool for war production only. Growing evidence of the need for financial help during the period of reconversion to peacetime production resulted in the establishment of the VT loan.

VT loans can be drawn after termination as working capital for reconversion either to other war contracts or to civilian production. Both V and VT loans are available not only to prime contractors but also to subcontractors and suppliers all the way down the line.

Interest and maturity both are suspended when contract termination halts production, and remain inactive until government settlement of the company's claim releases funds for eliminating the loan.

There are disadvantages. Banks or government agencies can tie up their guaranteed loan procedures with considerable red tape, and either type of loan must be applied for before cancellation has occurred. The urgency of the firm's need for financial help, however, often is greatest after termination.

In anticipation of this, a T loan is in prospect, a simplified type of government-guaranteed loan that can be applied for after contract cancellation. Suggested by the Baruch-Hancock Report last February, proposals for this type have been favorably discussed in Congress, and legislation may appear before the year is out.

### C. Termination Payments.

Three types of termination payments also are available to manufacturers working on war contracts. Advance payments, drawn from an advanced payment credit fund established before termination, are arranged for as part of the contract.

Partial payments are drawn after termination, to satisfy specific amounts as determined during settlement. Advance termination payments are drawn in anticipation of

such specific amounts, up to a figure which the contracting officer believes is the minimum of the final amount awarded.

Also to be considered as part of the pro and con are the tax implications involved. The V and VT loans are apt to incur a higher excess profit tax, but to ask less interest than termination payments. Check with your tax advisor as to which type of borrowing will be more economical under your contract.

It is good policy to see that your suppliers are posted on the availability of loans and termination payments, and if you yourself are a subcontractor, your prime contractor's approval on your loan application can facilitate its passage.

Partial payments to vendors are possible with the written consent of the prime contractor through whom the payment must come. The government can honor the claim of any supplier whose claim is thus approved, whether or not the claims of the prime contractor, or of other suppliers, have been presented.

### \$25,000 Locker Plant Is Authorized For Montgomery

MONTGOMERY, Ala.—A building permit for \$24,721 has been issued to the Montgomery Quick Freezing Co. to erect a locker plant of 820 lockers at 113 N. Lawrence St., Montgomery. Joe Ben Green and J. L. McDonald, builders of the project, said War Production Board approval had been received and most of the lockers already rented. It is to be a complete processing plant.

### SALESMEN

Nationally known appliance manufacturer with an exclusive line in its field is now building a post-war national selling organization. If you have sales ability, good appearance, pleasing personality, and have had previous appliance experience contacting dealers or distributors—here is an opportunity to establish yourself in a position that has the greatest future in the appliance field. Write giving age, experience, salary expected, references, and when available. Applications will be held in strict confidence. Address Box 1590, Air Conditioning & Refrigeration News.

### PROVEN PATENT AVAILABLE

**PRESSURE CONTROL VALVE**—completely automatic, simple, trouble-free. Proven in widespread use. Adaptable to commercial and domestic refrigeration, deep-freezers, air-conditioning applications. Prompt response to all inquiries. Reliability of patent and responsibility of all parties assured. Address inquiries to—

**Ralf Kircher**

Kircher, Lytle, Helton & Collett  
321 West First St. Dayton 2, Ohio

## Rigorous Navy Tests Can't 'Phase' Big Portable Box

### Many Sectional Coolers Follow Initial Order

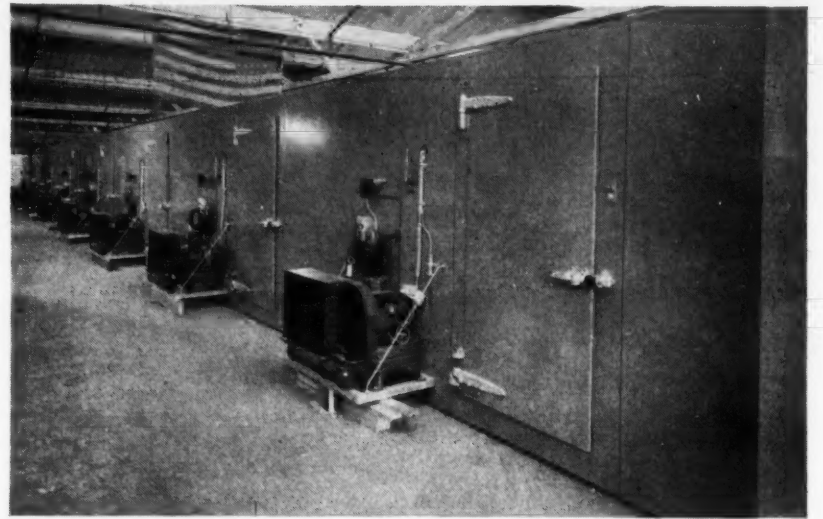
LOS ANGELES—How the refrigeration industry has met the type of exacting demands imposed upon them by the Armed Forces is demonstrated in the experiences of the Weber Showcase & Fixture Co. here in producing various types of equipment for the services.

An initial contract handled by the Weber company called for a 150 cubic foot portable low temperature refrigerator for the U. S. Navy. The job specified the construction of a box 8 by 8 by 6 feet, welded into one unit.

First unit of this type was subjected to what Weber believes to be the most rigorous tests ever given a box of this type.

The first unit was shipped in a railroad box car across 3,500 miles of the roughest road bed it was possible to find, and in the course of this trip it was subjected to every type of weather condition. Weber engineers who accompanied the box on this journey had the responsibility of keeping the refrigerator operated at a low temperature for 24 hours of each of the 15 days. At the end of this trip the charts showed that the box had maintained an average temperature of 80° F. during the entire trip.

This test satisfied Navy officials as to the ability of the box to hold temperatures properly, but they wanted



Claimed to be world's largest sectional knock-down type refrigerator, the walk-in cooler shown here was produced by Weber Showcase & Fixture Co. of Los Angeles. Eight separate condensing units are required to operate this box.

further proof that the unit would hold together, regardless of the conditions it might have to face in transit or service.

Accordingly, they loaded the refrigerator to its capacity and raised it six feet in the air to drop it on solid concrete. Inspection of the box showed that not a single seam split open and that the door was still perfectly balanced.

Not long after the production of this first order of portable refrigerators, Weber was commissioned to

produce more than 100 sectional, knock-down, walk-in refrigerators, approximately 9 by 14 feet in size, and 28 additional refrigerators of the same type, 12 feet wide and 96 feet long.

This unit was so huge that it required eight refrigerating machine sections, completely equipped with air convection blower units, to provide adequate refrigeration machinery to operate it. Weber claims that it was the first to build the world's largest sectional knock-down box.



### TO G-E DISTRIBUTORS AND CONTRACTORS

Here is another dramatic advertisement in the G-E series dealing with unusual applications of air conditioning and refrigeration, appearing in Time, Newsweek, Business Week and 15 industrial publications. The advertisement will reach key executives in many industries—helping to open new sales opportunities for you.

## "798...799...800...Impossible!"

This is a welding tip.

At every weld, it creates a miniature inferno of blazing white heat. It carries heavy surges of electrical current, so intense that the resulting heat will "melt" or fuse two pieces of metal together.

In the spot welding of aluminum, this intense heat has often made it necessary to stop production and dress or replace the electrodes as frequently as every 30 welds. Now,

however, by cooling the electrodes with a refrigerated liquid, it is sometimes possible to make as many as 800 welds before it is necessary to dress or replace the welding tips... another amazing application of G-E industrial refrigeration!

Many, many other new and improved techniques in refrigeration and air conditioning are helping industry do the "impossible" in war production today. They'll all be avail-

able, and ready for any commercial or industrial application after Victory.

To place your name high up on the preferential list for earliest available data on finer postwar air conditioning equipment, write now to: General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 4707, Bloomfield, New Jersey.

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## Manufacturers!

Do you now have authorized service facilities in Boston and Metropolitan area? And if so, will they be satisfactory for the post war business you are planning? If not, now is the time to get set.

Our firm have been service specialists for eighteen years and serve an area of two million people. We are well financed and have competent employees and ample facilities, shop space, trucks, stock rooms, etc. to do a fine job for you. We are familiar with air conditioning, domestic and commercial refrigeration, low temperature applications, including ice cream freezing and food freezing. We can offer complete service from application engineering to warehousing, delivering, installing and servicing on all kinds of refrigeration or other major appliances. We would appreciate an opportunity to discuss the possibility of making our service department YOUR service department.

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## Army Refrigeration Problems

By P. B. Reed

Manager, Refrigeration and Air Conditioning Division, Perfex Corp.

### The Evaporative Condenser (Cont.)

#### ENCrustATION OF DIRT ON CONDENSER COIL

Perhaps the most troublesome thing about an evaporative condenser is the necessity of keeping the condenser coil clean; or worse, cleaning it if it does become encrusted with deposits of dirt, mineral or other foreign matter. The condenser coil is hot, and dirt or other solid matter "burns" onto the coil and forms an insulation between the refrigerant and the water and air.

Keeping the coil washed with generous quantities of water helps, but the most important thing is to keep the coil temperature down so that the solid matter does not "burn" on the coil. If possible the coil temperature should be kept to 110° F. or lower in those localities where this problem is especially aggravating, but in other localities to 125° or lower.

One way in which the coil temperature may be held down is to remove the superheat of the discharge gas before it reaches the coil of the evaporative condenser. If this is done the coil temperature can usually be maintained below 125°.

The superheat of the hot gas may

be removed or reduced by passing the hot gas through a comparatively small air-cooled condenser before it is brought to the evaporative condenser. Some designs of evaporative condensers include a finned coil in the air stream before the main condenser coil, but after the eliminators, and the hot gas is passed through this coil before it reaches the main condenser coil.

In some designs the condenser coil is constructed of bare pipe without fins. This requires more pipe than if fins are used, but a finless coil may be cleaned more easily than one with fins. Finned type coils may be cleaned chemically but considerable care must be used to avoid ruining the coil with harsh uninhibited acid cleaning solutions.

#### CONNECTING TO WATER-COOLED HEADS OR JACKETS

If the condensing unit with which the evaporative condenser is used is equipped with water-cooled heads or jackets on the compressor, a tap may be taken from the water line above the circulating pump and led to the heads and then either wasted (taking the place of the waste from the overflow) or it may be led over to a separate spray nozzle or back into the circulating line with a small restrictor in the main line to equalize the pressure drop through the heads. By adjusting the amount of restriction in the main line, the per-

centage of water to the heads may be regulated.

Suitable materials must be used in the construction of an evaporative condenser; otherwise rust and corrosion will quickly damage the equipment. In some localities where the water contains acids or strong alkalis, it may be necessary to chemically treat the water to prevent excessive corrosion. If it is suspected that the water is causing excessive corrosion, it may be tested and suitable neutralizing agents may be added to the water as often as required.

#### WHAT TO DO ABOUT ALGAE

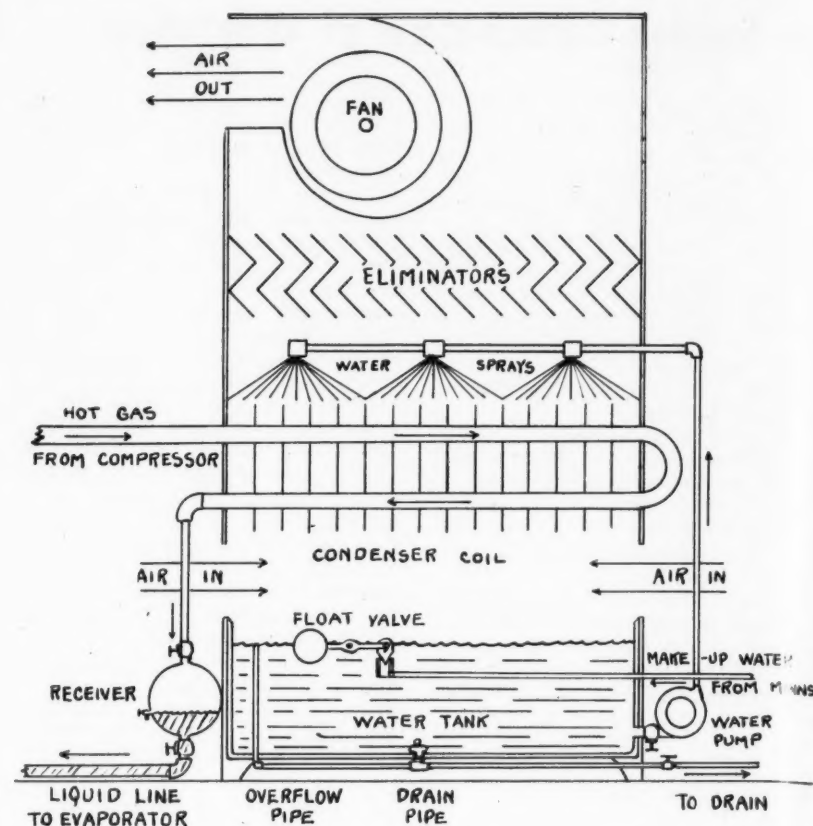
On some installations trouble has been experienced with the growth of algae in the water. Algae are vegetable organisms of many sizes and kinds. The green scum that forms on ponds is one of the most common and well-known of algae; and those that grow in the water of the evaporative condenser are similar.

They are very bothersome in the evaporative condenser as they stop up spray heads and valves, restrict the flow of water through the tubes, form and burn on the condenser coil, and give the equipment a bad appearance.

Increasing the amount of water wasted helps some but the growth of algae can be prevented by chemically treating the water with such preparations as Micromet or Calgon.

A research paper (RP-1305) on this subject may be obtained from the

Fig. 1. Schematic Diagram of Evaporative Condenser



Superintendent of Documents, Washington, D. C.

#### INSIDE OR OUTSIDE BUILDING

In southern climates it is practical to install evaporative condensers outside the building. Preferably they should be shaded, especially the receiver, but if not, should be painted with aluminum or light colored paint to reflect the maximum of direct sun heat.

Evaporative condensers may be placed indoors, usually in the basement in a room adjacent to the machine room. It must be remembered that the 15,000 (more or less) BTU per ton extracted from the hot gas is in the air from the evaporative condenser. Therefore this hot air must be ducted from the outlet of the evaporative condenser to the outside air, otherwise it would quickly heat the basement excessively.

It may not be necessary to duct outside air to the inlet of the evaporative condenser, but instead allow the room to act as a "plenum chamber" from which the evaporative condenser draws its air. If the evaporative condenser is in a room to itself, a window or windows may be left open to permit entrance of air.

In the winter-time care must be taken that the cold inlet air is regulated so as not to freeze the water and also that the air taken by the evaporative condenser does not impose too heavy a load on the general heating system for the building by reason of the large volume of air the evaporative condenser withdraws from the building and which consequently enters the building at various points and which must, of course, be heated. In other words, that it does not cause too rapid an air change.

In fact, it is very often possible and quite practical in the winter-time to drain the water entirely from the evaporative condenser (tanks, lines, pump, etc.) and use it simply as an air-cooled condenser by bring-

ing in some cold air from outside to the condenser coil. The amount of cold outside air should be regulated to prevent too low head pressures and associated troubles.

#### MAKING USE OF HEATED OUTLET AIR

Conversely, it is possible in winter-time to use the heated air, or some of it at least, from the evaporative condenser to heat some part of the heated spaces or rooms in the building by running short ducts from the outlet grille to the rooms, and return ducts from the rooms to the inlet grilles or to the room in which the evaporative condenser is housed.

In cold weather this method serves the dual purpose (by recirculating the air or a portion of it, with water circulation off) of holding the head pressure up and of heating a room or rooms.

(Concluded on Page 25, Column 3)

Aiding busy wartime hands  
to accomplish their jobs . . .

## IMPERIAL FITTINGS

★ Imperial Fittings for refrigeration and air conditioning work are built to help busy hands get jobs finished with speed and efficiency.

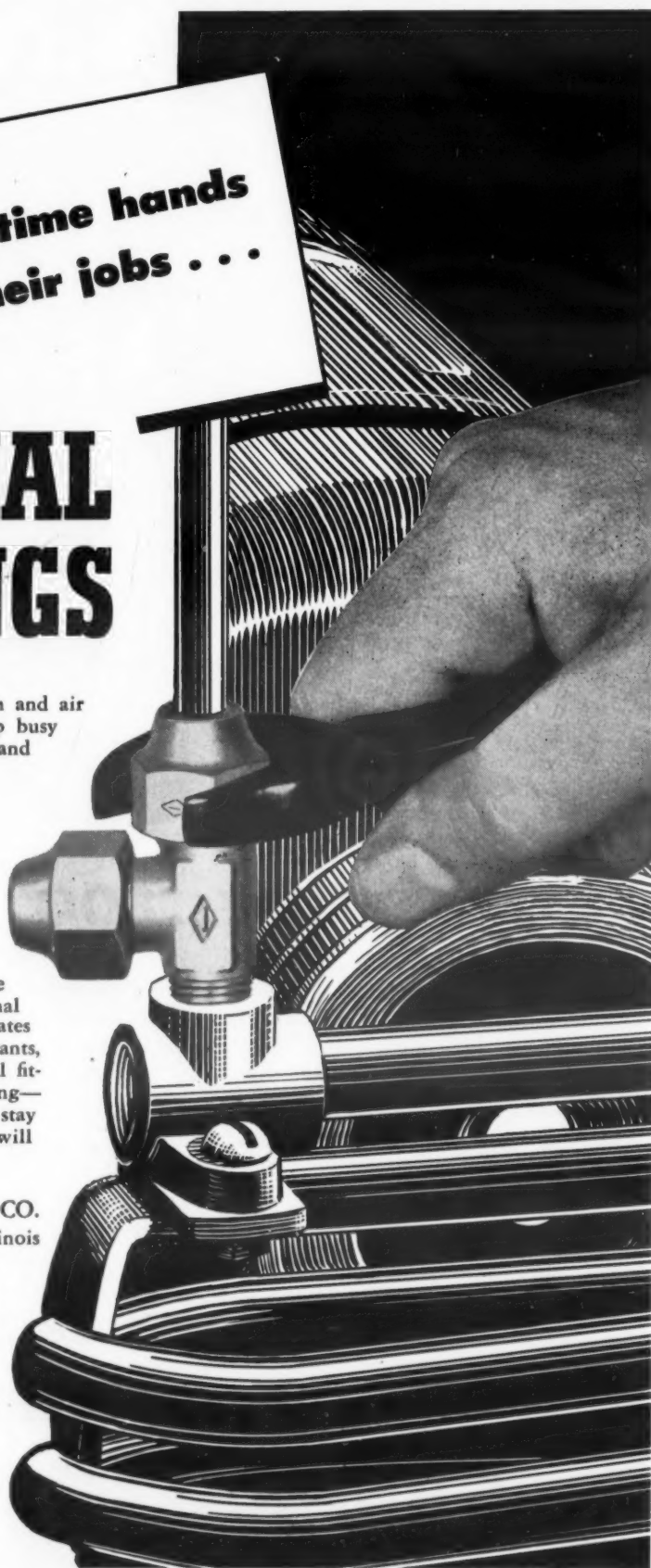
★ Wrench grip is made quick and secure by flats on elbow and tee bodies. Accurate threading, correct seats — resulting from careful quality control and inspection methods—make installation speedy and dependable.

★ Nuts, tees and elbows are made from brass forgings. This assures fine grain structure, freedom from internal stress, high tensile strength. It eliminates any possibility of seepage of refrigerants, season cracking or splitting. Imperial fittings will not distort under wrenching—they make tight connections that stay tight and that can be reconnected at will without damage.

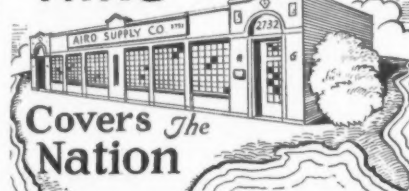
THE IMPERIAL BRASS MFG. CO.  
565 S. Racine Ave., Chicago 7, Illinois

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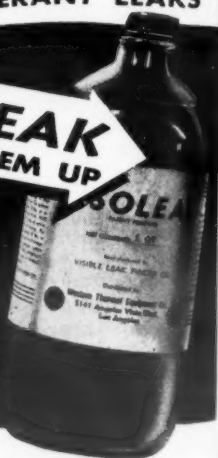
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Dept. B, 2732 N. Ashland Ave., Chicago 14, Ill.

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VISOLEAK is a finely-treated colored refrigerant oil which penetrates every nook and cranny of the system. The leak is indicated by a red stain — just like the discoloration on a carburetor in which ethyl gasoline has been used. Can be used safely and effectively with any type of refrigerant.

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4 ounce bottle \$1.00	48 bottles
8 ounce bottle 1.75	24 bottles
1 pint bottle 3.00	12 bottles
1 quart bottle 5.00	6 cans
1 gallon can 16.00	

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WESTERN THERMAL EQUIPMENT COMPANY  
5141 Angeles Vista Blvd., Los Angeles 43, Cal.

Please send me complete details about VISOLEAK.

Name \_\_\_\_\_

Address \_\_\_\_\_



## Trouble Chart For Evaporative Condensers

**Too High Condensing Pressure (above maximum pressures shown above corresponding to wet bulb temperature)**

1. Insufficient air or water due to: (a) low voltage; (b) blown fuse or overload relay out; (c) belts slipping; (d) loose pulley; (e) motor running in wrong direction; (f) obstruction in water lines; (g) in air ducts or grilles; (h) spray nozzles partially plugged; (i) too long or too small outlet air duct causing excessive static pressure against the fans; (j) dirty eliminators, causing air restriction.

2. Air in system. Check by comparing idle head pressure with that corresponding to the room temperature, as outlined in July 3, 1944, issue. Read the head pressure after a prolonged shut-down of both the condensing unit and evaporative condenser, such as first thing in the morning after a night of non-use. If evaporative condenser is mounted outside the building, take reading before direct rays of sun fall on the evaporative condenser.

3. Too much refrigerant in system. Some designs have test cock or other method of determining height of liquid refrigerant in the receiver. Sometimes it can be told by "feel" of receiver, especially when the latter is hot. (A torch flame may be played LIGHTLY on the end of the receiver; the portion below the liquid level will stay much cooler than that portion above the liquid level.)

**CAUTION:** If care is used, this method is not dangerous, but can be if the receiver is full of liquid and is overheated. There is no need in having the receiver more than  $\frac{1}{4}$  full of liquid refrigerant when the equipment is in normal operation.

4. Coil is dirty or encrusted, thus insulating it from the water and preventing the proper transfer of heat from the hot gas to the water. In some designs the coil is finless and these may be scraped or chipped clean. Finned types may be cleaned chemically; see later issue for method.

### Too Low Condensing Pressure

1. System low on refrigerant charge. Check as per above.

2. Inlet air to evaporative condenser cold. This may occur in winter in northern areas. As a correcting measure, air may be taken from and recirculated to inside rooms.

### Noisy Operation

1. Water in fan housing; especially noticeable at start of run.

2. Fan out of balance.

3. Bearings worn and/or needing oil.

4. Fans or pulleys loose on shafts.

5. Too much end-play of fan shaft.

6. Shaft bent or belts too tight causing whip in fan shaft.

7. Loose panels of housing or panels not adequately braced.

8. Transmission of vibration to ductwork due to failure to use canvas connection from fan housing to duct.

9. Rattles due to pump, motor, hangers, tubes, pipes or other parts being loose.

10. Belts too loose—"flopping."

11. Evaporative condenser not level or one leg not firmly on floor.

12. Air noise due to incorrect placement of fan in housing, or whistling due to sharp edges or obstruction in ducts.

### Follow Manufacturer's Instructions

Each make of evaporative condenser or other refrigerating equipment has certain features or methods of construction peculiar to that particular design. The instructions issued by the manufacturer of the equipment should be followed implicitly, for he is in the best position to determine the peculiarities of his own equipment, and certainly he will be most interested in recommending maintenance and service practices that will cause the equipment to operate to the highest efficiency and uphold the manufacturer's reputation.

The foregoing description of an evaporative condenser and the methods of maintenance and repair are offered as data to supplement that of the manufacturer or to supply instructions in the absence of manufacturer's data, but not to supplant them. In possible instances where there is conflict between the two, the manufacturer's instructions should be followed rather than the above, for his instructions are much more apt to be correct for his peculiar design, rather than the above generalized information.

## Service Methods For Evaporative Condensers

(Concluded from Page 24, Column 5)

This method was used quite effectively by the Refrigeration Unit of the Repairs and Utilities Branch in several posts in the Sixth Service Command. In one camp the inlet air was too cold so it was mixed with air drawn in from the room housing the three 20-h.p. condensing units refrigerating the cold-storage warehouse. The air withdrawn from the machine room was replaced by warm discharge air from the evaporative condenser and by regulating the dampers in the by-pass ducts to and from the machine room, it was found that the machine room could be heated very satisfactorily without other heating facilities, and the condensing pressure held up to a satisfactory operating pressure.

### MAINTENANCE AND SEASONAL INSPECTION

At least once per season the water sump tank should be drained, scoured and rinsed with a solution of water and washing soda. The condenser coil should be inspected and cleaned if necessary. The water pump should be checked over and the bearings repacked if required.

The fan shaft bearings should be checked and if they are ball or roller bearing types, they may require repacking. Check shaft couplings, if any. Inspect set screws securing fans to shaft and tighten if necessary. If water stands in the fan housings, clean out the small drain hole in the bottom of the housing.

### MONTHLY INSPECTION

Put on gauge and check discharge pressure.

Inspect eliminator plates and clean them if necessary.

Inspect sprays and remove and clean any nozzles that are not throwing a full spray of water.

Oil motor bearings and fill other oil and grease cups.

Check belts for tension and replace if badly worn. In multiple sets, replace entire set with a set of matched belts, not just one belt.

Clean off any obstruction that may have accumulated on wire grilles, on air inlets or outlets.

If trash or dirt is evident in the water or on the surface of the water in the sump, drain and clean and increase wastage.

## Carr Gets Promotion At Westinghouse

PITTSBURGH, Pa.—G. Edward Pendray, assistant to president of the Westinghouse Electric & Mfg. Co., has announced the appointment of Richard C. Carr as manager of institutional advertising.

Mr. Carr will be responsible for the company's institutional copy, the commercials for the Westinghouse radio programs, the Public Relations production department, and for other printed advertising matter.

Mr. Carr joined the Westinghouse company in October, 1943, coming from the Libby-Owens-Ford Glass Co. where he was manager of the war housing division. Previously he was a contact and general agency man for the Sun Advertising Co.

## Building Owners Plan Air Cooling, Assn. Says

PHILADELPHIA—Office building owners plan to spend \$100,000,000 for modernization immediately after the war, and a big share of that money will be invested in air conditioning equipment, indicated S. M. Buckingham of Cleveland, vice president of the National Association of Building Owners, which held a convention here recently.

A vast backlog of structural improvements is being built up to help cushion the shock of peace and to provide quick employment in the early postwar period, according to Mr. Buckingham, who pointed out that most office buildings in the nation are at least 15 years old and that repairs and equipment replacements have been held to a minimum under wartime restrictions.

In addition to air conditioning, building owners will concentrate on elevator replacement and general modernization work, it is said.

## Locker Producer Now Features Rust-Proofing

CHICAGO—Safe-Way Food Locker Co., which recently announced that its food lockers were available for prompt shipment, has stated that all the steel used in fabricating the lockers is rust-proofed by a special process.

Operators of locker plants need have no fear that baked enamel finish of the lockers will blister or chip due to hidden rust, the company claims.

## Valves for all refrigeration purposes!

The Weatherhead reputation in the refrigeration field has long been due to the practical engineering with which we endow the many products we make for this industry. Our line of refrigeration valves has been designed and engineered by Weatherhead men who have gone into the field and studied each product in scores of routine uses. As a result, Weatherhead refrigeration valves embody numerous refinements which, coupled with our years of production know-how, make them the first choice of seasoned refrigeration designers and engineers for both domestic and commercial units.



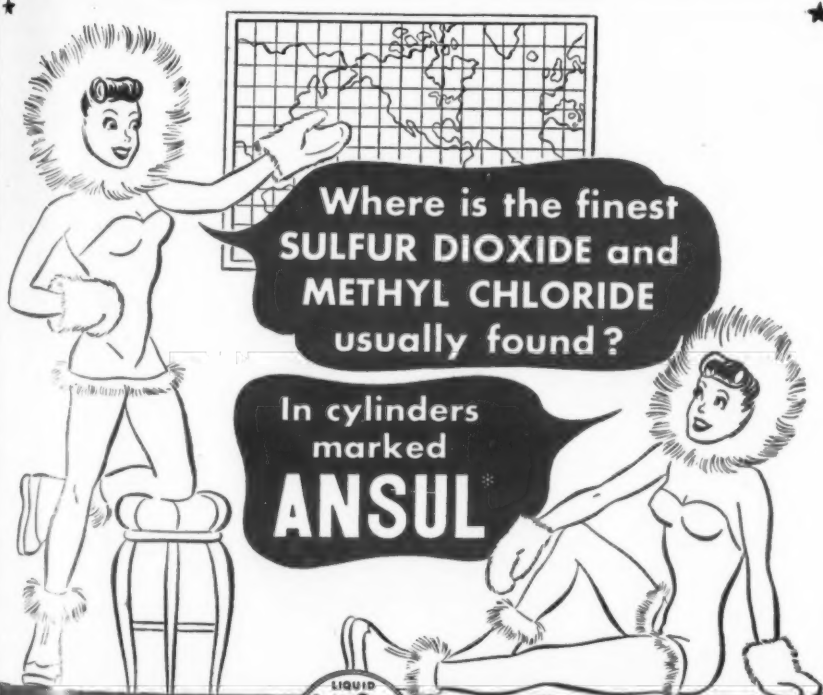
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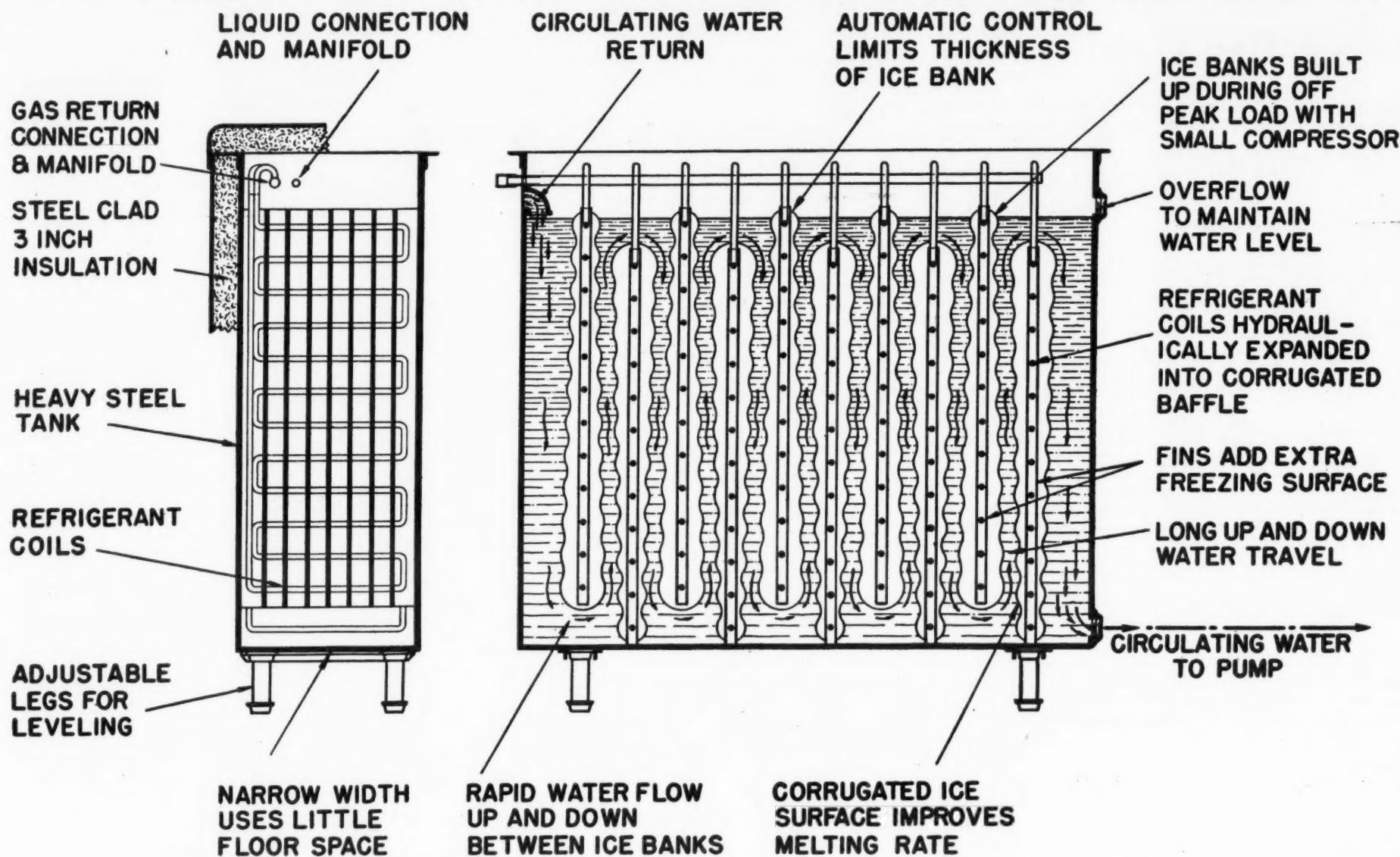
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AC-4-44A



## Details of a 'Storage of Cold' System Which Piles Up Refrigerating Effect Until It's Needed



## Accumulator ('Storage of Cold') System Can Reduce Size of Equipment Needed

By F. O. Jordan, Mechanical Engineer,  
Albert Kahn Associated Architects & Engineers, Inc.

The storage of 'cold' must not be confused with 'cold storage.' In cold storage, refrigeration is employed to store perishable commodities for future use. In the storage of 'cold' discussed in this article, it is the refrigeration itself that is stored for future use.

There is no advantage in storing cold or 'refrigerating effect' when refrigeration machinery is used except for the installation where the refrigeration load comes only in

short, high 'peaks' followed by long no-load periods.

An example of an application where storage of cold is advantageous is milk cooling. Here, the milk is cooled in a comparatively short space of time after pasteurization. Therefore, there are two load periods of brief duration per day, immediately following the morning and evening milking periods. The remainder of the day there may be no load at all.

The advantage in storing refrigerating effect is that a smaller refrigerating machine may be installed for carrying a given peak refrigeration load. If the refrigeration load on the milk-cooling job were 60,000 B.t.u. during the peak hour, a 5-ton refrigeration plant would be required if no means for storing refrigerating effect were installed. But if the refrigeration machine were operated most of the 24 hours and its refrigerating effect stored for use during the peak hours, a machine of fractional tonnage might suffice.

### FACTORS IN DECIDING

Obviously, the substitution of the smaller refrigeration machine would tend to reduce the cost of the plant.

On the other hand the installation of the equipment for storage of refrigerating effect would involve additional expense. Furthermore, the refrigeration machine generally must be at a slightly lower temperature level, which means a slightly lower efficiency. Unless the peaks are relatively short and far between and considerably higher than the load existing most of the time, there may be no economic justification of the storage equipment. However, there are many types of refrigeration and some air conditioning jobs where the storage type of installation is a very good investment.

### APPLIED TO A SPECIFIC CASE

It always has been difficult for the owner to make up his mind that it will pay him to install a relatively large and expensive air conditioning plant when the occupancy period of the space in question is of short duration.

The proprietor of a certain cafe-

teria decided against the purchase of the 25-ton air conditioning unit proposed by a salesman, even though the refrigeration load on his eating establishment during the peak hour was 25 tons. He felt that the connected load ran up his demand charge too high—even though his operating time per day did not exceed three hours. Furthermore, he said the cost of installation was a lot of money to charge off against so few hours. Per hour, it looked too expensive.

Another salesman told him he could do the job with 5 hp., because he would let the little compressor keep on running during the off hours and store up refrigerating effect for keeping the customers cool and in good appetite when the crowded in, even though the refrigeration load was 25 tons while they were all there. This brought the demand charge down low enough for the proprietor, who had to make the eating establishment pay dividends, and the total cost was not much more than one-half the price the first salesman had quoted. There are a lot of jobs where the same thing is going to happen.

### USE IN ADDING CAPACITY

Another place where storage of refrigeration is feasible is in adding more air conditioning capacity to existing installations. Take for example the manufacturer whose office building is air conditioned to the extent of 200 tons of refrigerating effect. Suppose the workers in the factory building demand summer comfort, too, even though another 400 tons is required. Or suppose the manufacturer decides to treble the size of his office space. Does he have to buy a complete 400-ton plant in either case? The answer is 'No,' if his present air conditioning plant operates only eight hours of the 24 hour day.

All this manager has to do is buy the necessary refrigeration storage equipment and let his present refrigeration plant run 24 hours per day (Concluded on Page 27, Column 1)

## VIRGINIA Refrigerants



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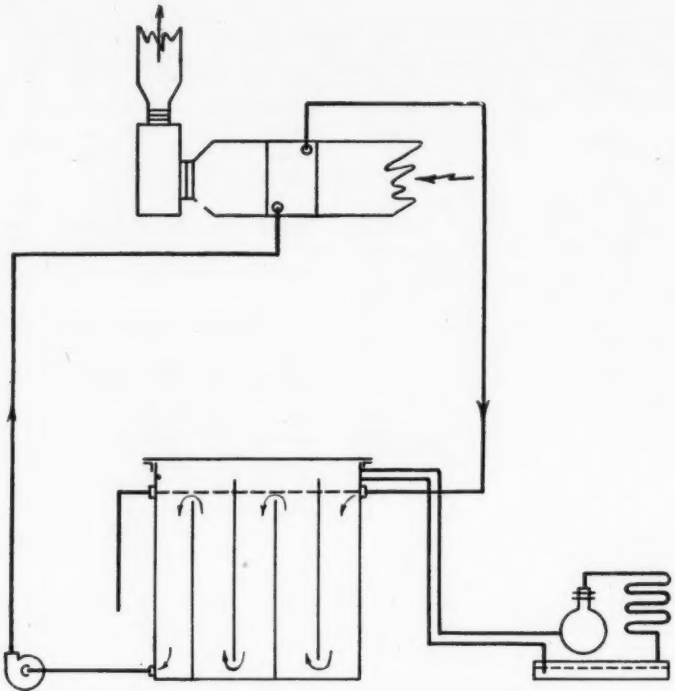
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## The Accumulator System In Air Conditioning



TYPICAL ACCUMULATOR SYSTEM

This is how the "storage system" of refrigeration should operate in an air conditioning installation. The accumulator tank (center bottom) freezes ice during the off-peak hours. When the air conditioning chamber (top) calls for refrigerating effect water is pumped through the tank and up through the conditioning chamber and then back to the tank.

## How Refrigerating Effect Is 'Stored' For Use at the Peak Demand For It

(Concluded from Page 26, Column 5) during the hot weather. During the 12 hours when the people are gone the plant will store enough cooling to take care of the whole demand while the folks are on the job.

Refrigerating effect could be stored merely by cooling a tank-full of water. But the necessary volume makes this impractical. Furthermore, the water would keep getting warmer as soon as the plant started to use it.

The way refrigerating effect is stored in actual practice is to freeze

use of a brine that is liquid at 15° F., but freezes at some slightly lower temperature. Then you store your low temperature refrigerating effect by freezing the brine to a sort of slush and the latent heat of freezing still works in your favor.

The first plants to make use of ice-freezing for storage of refrigerating effect were "home made" affairs, involving tanks, baffles, pipe coils, and various gadgets that happened to be handy, or appealed to the individual taste and imagination of the installer. Results were not always satisfactory, and costs generally tended to be high. Sometimes tanks froze and burst.

Reputable refrigeration manufacturers have long since taken over the problem and worked out the "bugs." Standard equipment made on the production line has been available for years for storage of refrigerating effect by the freezing method. There are numerous manufacturers of it.

### NATURE OF THE EQUIPMENT

Tanks, or accumulators, made for storage of refrigerating effect by modern manufacturers are compact, rectangular affairs with evaporator tubing arranged so the ice freezes in cakes to form baffles insuring long water travel in contact with the ice with the result that water is taken from the tank at even, low temperatures. Controls are provided for stopping ice formation before water passages can become blocked or damage done. Evaporator tubing may or may not be finned.

Calculating the refrigeration load to be used as the basis for making the equipment selection for the refrigeration storage type of refrigerating or air conditioning plant is a bit more complicated than the calculation for the job where storage of refrigerating effect is not contemplated.

### FACTORS IN ESTIMATING LOAD

The maximum or peak load must be calculated in the usual manner for selecting the capacity of the air calculating equipment and the air conditioning coil. However, the refrigeration end of the plant must be

determined on the basis of the total or accumulated load for the entire 24 hours. Therefore, this must be calculated.

Of course, simple quantities like the total quantity of milk to be cooled for the dairy job, or the total wattage used for illumination in the air conditioned cafeteria are easy enough to figure. But the actual accumulated effect of sun and transmission loads are not only periodic, but variable.

Obviously it would be incorrect to calculate sun load by multiplying the number of hours the sun shines on a given exposure by maximum sun intensity, for the sun's heating effect waxes from nothing as it rises to its mid-day heat at high noon and then wanes to nothing again as it sets. However, factors have now been developed for calculating the cumulative effect of such variable loads.

Of course, there is nothing new in any of this. Everything brought out has been in use for several years. However, some engineers must have missed the value of storing refrigeration on certain types of installations, judging by some of the jobs installed recently. This type of system is especially timely at this writing when refrigerating machinery is so hard to get.

### Herman Hantober Files For New Company

LOS ANGELES—H. & W. Refrigerator Co. is the firm named under which Herman Hantober has published a certificate that he is conducting business at 913 South Olive St., Los Angeles.

## Declare 'Silicone' Can Boost Motor Output

MIDLAND, Mich.—Longer life, or more power from the same size motor are perhaps the most interesting possibilities of the new silicone insulating materials developed by the Dow Corning Corp., a subsidiary of Dow Chemical Co. and the Corning Glass Works, and recently tested in electrical applications by Westinghouse Electric & Mfg. Co.

By using high temperature resistant silicones for the electrical insulation in a 3-hp. motor, Westinghouse engineers increased its output to 10-hp., according to W. R. Collins, vice president and general manager of Dow Corning Corp.

In revealing the performance of the first commercial production of these silicones, Mr. Collins stated that they are the result of a century's research to utilize silicon and oxygen, the elements of which sand is composed, in the production of new temperature-resistant materials.

"Among the most important of these silicone materials are high temperature insulating resins, but silicones can be produced either as solids or liquids in an infinite variety of forms," he added.

Three possible major benefits are offered to the electric motor industry by these newly developed materials, according to M. W. Smith, vice president in charge of engineering for Westinghouse:

"First, because of silicone insulation's resistance to heat, reduction in size and weight of electrical equip-

ment can be made for a given output, or

"Second, greatly increased life can be obtained in the same size and weight, or

"Third, machines with silicone insulation may be placed in operating locations where surrounding temperatures are higher than has been possible heretofore."

On motor applications, Westinghouse engineers found the new insulation greatly increased power, the rate of increase being more than 200% on one design of a 3-hp. motor. While this rate of power increase is not typical, marked increase in the output of small motors can be expected, it is said.

The ratio of increased power lessened gradually in applications on successively larger motors, but was still 28% on a 3,800-hp. unit. In all such applications, the increase was without addition of size or weight.

### New Assignments Put Iron Quota Over Top

WASHINGTON, D. C. — Assignment of quotas for 278,500 electric irons to four additional manufacturers, the eighth group of manufacturers authorized to produce electric irons in fulfillment of the 1944 civilian program for 2,000,000 has been reported by WPB. This brings total authorized iron production to 2,037,838, about 2% in excess of the program.

The irons will not be rationed, nor will a certificate testifying to the purchaser's need of an iron be required, WPB officials said.

## The REFRIGERATOR that comes when called



OUR TROOPS smash their way to new positions . . . and supplies must move forward. Mammoth 10-ton refrigerated trailer trucks bring fresh meats and other perishable foods to weary, hungry fighters! Such rolling refrigerators are made possible by a compact gasoline-driven refrigerating unit developed in the laboratories of the York Corporation for the Army Quartermaster Corps. They can maintain a constant temperature as low as 10°F. . . even in tropical climates where the mercury may soar to 120° and roof temperature to 150°. Each unit operates automatically and is entirely self-contained. The demands on refrigeration and air conditioning brought about by the exigencies of war will have a profound effect on peacetime food distribution. Today York and leading trucking concerns foresee fleets of refrigerated trucks swiftly rolling up and down the land . . . operating at America's beck and call . . . carrying the good, fresh food to help a strong nation grow stronger.

LITTLE BROTHER. . . Where terrain is mountainous and the going too rough, portable refrigerating units are transported on trailers. Since these York engineered units are also automatic and completely self-contained, they can be dropped off to act as a commissary for isolated detachments . . . Wherever soldiers can be followed, fresh food also goes.



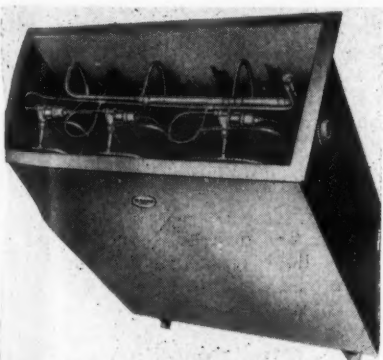
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**YORK** REFRIGERATION AND AIR CONDITIONING  
HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885



Accumulator tank built by McQuay, Inc., showing arrangement that provides baffle effect, insuring long travel of the water or brine that serves as the ultimate refrigerating medium.

ice. For every pound of ice frozen, 144 B.t.u. of refrigerating effect are stored and are made available merely by melting the ice. Furthermore, the water keeps coming out of the tank at practically the same temperature as long as any ice remains, provided the installation is properly made.

Ordinary water works out well enough for air conditioning work and for refrigeration where the desired temperatures are not too low. But suppose you want to refrigerate something to 25° F. Probably you would want to circulate the water to the commodity to be refrigerated at about 15° to get a good working temperature differential. But water at 15° does not circulate well through piping.

Under such conditions you make

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# Contamination of Factory Air Can Slow Down U. S. Arms Output

## Proper Conditioning Keeps War Workers From Suffering Effects of Bad Air

GRAND RAPIDS, Mich.—At all times industry plays an extremely important part in contributing to the nation's well being, and within industry it is becoming increasingly evident that proper air conditions are essential for the health and efficiency of workers. During wartime, industry assumes even more importance and likewise, with a vastly increased number of employees, it is necessary that air in factories be free of contamination.

That increasing attention is being given to air contamination in industry was evidenced at the meeting of the American Society of Heating & Ventilating Engineers held here this summer, when three technical papers concerned with industrial ventilation and air contamination were presented. Herewith AIR CONDITIONING & REFRIGERATION NEWS presents excerpts from the three papers:

Excerpts from the first, "Industrial Exhaust Ventilation in Industrial Hygiene," prepared by Major Allen D. Brandt, sanitary engineer with the Safety and Security Branch, Office of the Chief of Ordnance, Army Service Forces, follow:

### IMPORTANCE OF CLEAN AIR

One of the more important phases of industrial hygiene, if not the most important, is atmospheric sanitation. The air, like water, milk, foods, etc., must be relatively free of harmful contaminants if the health of the individuals breathing the air is to be maintained at a high level. Even though most air borne contaminants (dusts, fumes, mists, smokes, and gases) are toxic to a greater or lesser extent, a certain amount of atmospheric contamination is permissible without affecting adversely the health of the exposed individuals.

The permissible amount of contamination varies from individual to individual and from substance to substance, but for a given substance the health of the average individual (considered as a group) is not affected adversely by breathing air con-

taining a given amount of the contaminant.

For some materials the safe amounts have been determined rather accurately and for other substances a tentative value has been established on the basis of comparable chemical structure, comparable physiological reaction, or field experience. These safe limits are called maximum allowable concentrations and are usually referred to merely as M.A.C.

The M.A.C. of a given substance might be defined as the atmospheric concentration of the substance which will have no measurable deleterious effect upon the average individual who breathes the contaminated air eight hours daily. This does not mean that no workers exposed to atmospheric contaminants in the range of the maximum allowable concentrations will show ill effects. Some individuals display unusual susceptibility to certain substances and will show signs of illness even if they work in atmospheres which are not contaminated in excess of the maximum allowable concentration. In general, however, if the atmospheric contamination in industry does not exceed the maximum allowable concentration for the substance or substances in question, the large majority of the exposed workers will show no demonstrable ill effects.

### CONCENTRATIONS VARY

The maximum allowable concentrations vary tremendously from substance to substance. The units in which these concentrations are expressed vary also from substance to substance but, in general, are similar for similar types of substances or types of physiological reactions. Thus the M.A.C. for hydrogen sulfide is 20 ppm; for gasoline 1,000 ppm; for lead the M.A.C. is 0.15 mg/m<sup>3</sup> and for TNT it is 1.5 mg/m<sup>3</sup>.

Experience in a number of industries has shown that (1) occupational illnesses of a respiratory of systemic nature are rare if workers are not exposed to atmospheric contamina-

tion in excess of the maximum allowable concentration; (2) the incidence of occupational illness increases rapidly if workers are exposed to excessive amounts of atmospheric contamination; and (3) the atmospheric contamination can be kept below harmful limits by engineering measures.

Atmospheric contamination in industry is more common than most people realize. Many persons feel that so long as the air is not visibly contaminated or does not cause irritation to the nose and throat, it is respirable, that is, safe to breathe. Consequently, they feel that only relatively few operations or processes are of concern from the point of view of atmospheric contamination.

This is, of course, erroneous, for the air may appear perfectly clean and may be wholly free from any irritating action even though it is contaminated greatly in excess of the maximum allowable concentration. It must be remembered that wherever materials are being processed, whether changing the physical or chemical state or the physical size, some of the material will escape into the workroom air in the form of dusts, fumes, mists, or gases, except where the operations or processes are conducted in air tight systems or in closed systems maintained under negative pressure.

### MOST PROCESSES SOURCES OF CONTAMINATION

Therefore, consideration must be given by engineers to the problem of atmospheric contamination by most processes and at most operations rather than those few operations or processes which produce visible contamination.

The measures commonly employed for the prevention of excessive atmospheric contamination in industry are as follows:

1. Control of the dust, fume, mist, smoke, or gas at the point of generation or dissemination. a. Local exhaust ventilation; b. Enclosures; c. Wet methods; d. Good housekeeping.
2. General ventilation.
3. Isolation or segregation of the operations producing atmospheric contamination.
4. Substitution of less toxic materials for the toxic ones or of less objectionable operations for the ones producing much contamination.

Of these measures, local exhaust ventilation and general ventilation are by far the most important.

Local exhaust ventilation, sometimes referred to by industrial ventilating engineers as process ventilation, is usually employed to control the dust, fumes, gases, or mists at specific and major sources of contamination, whereas general ventilation is applicable to areas having scattered minor sources of contamination.

General ventilation is unsatisfactory for the control of important sources of contamination, particularly if workers are nearby, since the

ventilation rate must be enormous to result in adequate dilution of the contaminated air between the source of contamination and the worker's breathing zone.

A local exhaust ventilation system usually consists of four main parts—hoods or enclosures, ducts, exhausters, and collector or collectors. Of these, the hood is probably the most vital. It is the purpose of the hood to enclose or partially enclose the source of contamination or to produce air movement at the source of contamination of suitable magnitude and acting in the proper direction to capture the escaping contaminants and convey them into the exhaust system.

### RULES FOR HOOD DESIGN

While the design of a good hood involves many considerations, the following specific rules should be kept in mind at all times: (1) Enclose the source of contamination as much as possible, (2) locate the hood in line with the natural direction of movement of the contaminant or contaminated air, (3) locate hoods which do not enclose the sources of contamination, as close to the sources as possible, and (4) for hoods which must be located at some distance from the source of contamination, use large hood openings and flanges if possible.

The velocity of air movement at the source of contamination necessary to capture the contaminant may vary from as little as 75 fpm, a velocity sufficient to overcome normal air currents, to as high as 2,000 fpm or more, at a high velocity dust producing machine such as a jack hammer.

Even though these velocities will do a satisfactory job if the operation is carried out as intended, and if other adverse influences are prevented, it is very easy to create conditions which will render the local exhaust system ineffective. For instance, any unusual motion in the area of the source of contamination will interfere with the control air currents created by the hood and render the control ineffective. Also opening doors or windows near a local exhaust hood on a moderately windy day will impair the effectiveness of the control.

### EFFECTIVENESS OF HOOD

To obtain a clearer picture of the importance of this particular item, namely, that the operation be carried out as intended when the hood was designed and that all adverse influences be avoided, it is only necessary to reflect upon three facts: (1) most minimum control velocities are 300 fpm or less, (2) the average person walks at the rate of about 350 fpm, and (3) the velocity of air movement through open doors and windows on a moderately windy day is in the order of 500 to 1,000 fpm. Hence little disturbance is required to upset the control velocity pattern at most operations with the result that some of the contaminant will escape into the general room air.

This fact is most important since it is not uncommon to find that open doors and windows near operations provided with local exhaust ventilation render such control measures essentially useless. The fault lies in the design of the plant layout—operations of this nature should not be located near doors and windows. However, with construction completed and the plant in operation, the only solution is in the erection of air barriers and the education of the worker to open doors and windows judiciously.

In small rooms or bays where all operations must of necessity be located near the doors or windows, the education of the workers in the proper performance of the operation and the wise regulation of doors and windows is essential.

It is apparent that the area of the openings into the hood should be as small as is consistent with satisfactory performance of the operation so that the volume of air required is kept at a minimum. It has been our experience that existing installations (particularly spray paint booths) which do not afford adequate control because of low control velocities may often be made adequate by decreasing the area of the opening without interfering significantly with the performance of the operation.

To obtain good results, the edges

of the hood should extend beyond the edges of the tank or table. It is essential that operations requiring canopy type hoods be located away from doors and windows since extraneous air currents influence the control air currents very readily owing to the relatively large open area between the top of the table or tank and the bottom of the hood.

### OBJECTIONS TO CANOPY

Even though there are many sources of atmospheric contamination which may be controlled adequately by means of canopy type hoods, they are not as common today as they were years ago. An important disadvantage of, and objection to, canopy hoods at many operations is that the contaminated air is moved through the breathing zone of the worker and consequently does not protect the worker at the operation even though the contaminant is prevented from escaping into the general workroom air. Canopy hoods are being replaced to a great extent by slot type lateral exhaust hoods, and by down draft ventilation.

Whenever slot type hoods are used on tanks, table tops, and the like, they should be located at least on both long sides of the tank and preferably along the entire perimeter. Even with the same total ventilation rate, better control is accomplished since a higher velocity is maintained at the tank edge, where interference from extraneous air currents created by movement of nearby workers is the greatest.

It is necessary that the fundamentals of air flow into suction openings be understood thoroughly if the engineer is to be able to design local exhaust ventilation systems which will control the contaminant effectively and economically. A much too large percentage of the installations seen by us either do not control the contaminant effectively or are so completely over designed that they are wasteful of power and present unnecessary heating problems.

### BASIS OF DUCT DESIGN

The ducts should be designed almost entirely on the basis of transporting velocity which varies from about 1500 to 5000 fpm, depending upon the nature of the contaminant. As a rule, the system should be so designed that it will be balanced, eliminating the need for adjustable dampers in some branch ducts. Such dampers are a constant source of trouble. Long radius bends are desirable and branch to main duct connections should have an included angle of less than 30°.

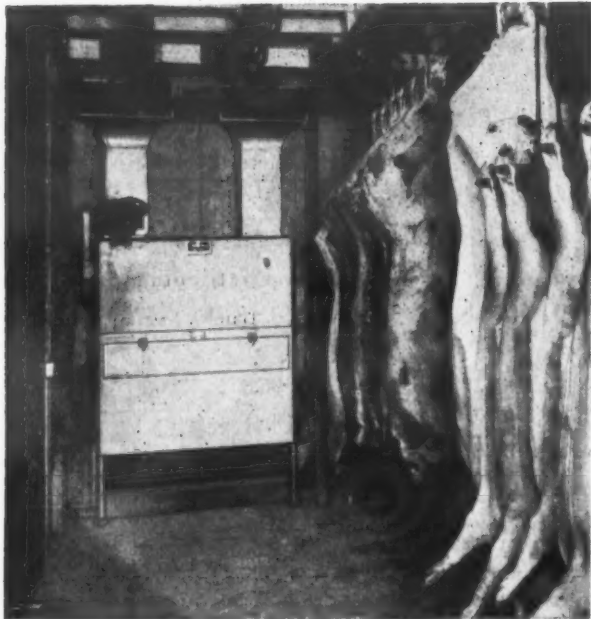
Collectors are not always needed in local exhaust ventilation systems. If the contaminant is of no value, does not present a nuisance if discharged into the atmosphere. (Concluded on Page 29, Column 1)

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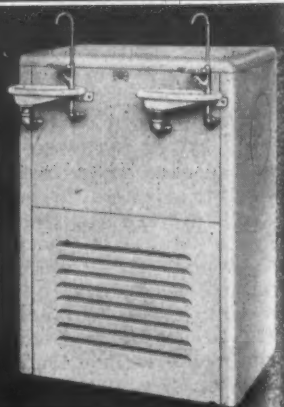
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# Methods of Preventing Contamination Of Factory Air Are Outlined

(Concluded from Page 28, Column 5)

and does not present a fire, explosion, abrasion, or corrosion problem in the ducts or fan, collectors are not necessary. As a rule, collectors should be located upstream from the fan and it is sometimes advisable to have them located as close to the hood as possible for reasons of fire and explosive safety.

In the explosives manufacturing and processing plants, for example, most of the local exhaust ventilation systems which have been installed in the last year have an industrial collector of the wet type located adjacent to, or as close as possible to, each hood so that the explosive contaminant is not conveyed through considerable duct work. Also particular attention is paid to the location of a wet collector in each branch duct so that in the event of a fire or explosion at one operation it will not propagate to other operations.

## CENTRIFUGAL EXHAUSTERS USED

Exhausters are usually centrifugal type fans, or ejectors. Propeller type fans are sometimes used if the resistance of the system is very low. For most operations centrifugal fans are preferred since ejectors, whether air, steam or water operated, are inherently very inefficient. However, where the contaminant is flammable, explosive, or unusually corrosive, ejectors are used frequently. A fair percentage of the exhausters in the local exhaust ventilation systems in the Army explosives manufacturing and processing industries are air or steam operated ejectors since most of the contaminants transported through these systems are highly flammable and explosive.

As stated previously, general ventilation is satisfactory for the prevention of excessive atmospheric contamination in rooms or buildings housing operations or processes which present minor and scattered sources of contamination. Control of excessive contamination is accomplished by introducing sufficient uncontaminated air to dilute the contaminant to a level below the maximum allowable concentration.

The volume of air needed can frequently not be determined with any degree of accuracy. However, a fair estimate of the increase in ventilation needed to control excessive contamination in a given room or building may be made by determining the degree of atmospheric contamination, and estimating the existing ventilation rate. From these values the additional volume of air needed can be computed readily.

## HOW TO DETERMINE AMOUNT OF SOLVENT USED

In rooms or buildings where operations are conducted involving, for example, the use of a solvent, the quantity of solvent used daily may be ascertained from the stock room records or other records which indicate the rate of consumption.

It may be well to point out that the important factor in general ventilation is the ventilation rate in terms of cubic feet per minute and not air changes per hour. This fact is not commonly recognized and engineers are frequently heard to express the thought that the recommended ventilation rates in cubic feet per minute are too high because that will be over 20 air changes per hour.

The rate of air change means little unless the size of the room is taken into consideration. For instance, with good air distribution and all other things being equal, 10 air changes per hour in a room of a given size will result in the same degree of contaminant control as 30 air changes per hour in a room having one-third its cubical content.

## EXPLOSIVES HAZARDS

In the Army explosives manufacturing and processing plants we encountered some problems which are unique in industry and which presented new problems. The size, location, and distribution of the buildings presented an extraneous air movement problem. The nature of the

contaminant and operations presented a serious fire and explosion hazard. The nature of the industry presented an important economic problem, that is, the frequent changes in operations and anticipated short life of the industry dictated in favor of low first cost even at high operating and maintenance costs.

The problems were solved by using ventilation only where absolutely necessary and preventing excessive exposure to workers by enclosing the operations as much as possible, rotating workers, and using respirators at operations presenting intermittent exposures. Nevertheless, a large number of local exhaust ventilation systems were found necessary.

The systems installed may be grouped into three general classifications, all of which have been found satisfactory from both the health and safety viewpoints. These groups are as follows: (1) Unit systems with an industrial wet collector located adjacent to, or close as possible to, each hood. (2) Unit systems with all ductwork sloping downgrade toward a sump located outside the building, and with sufficient water sprays located throughout the ducts to keep all interior surfaces of the ducts and fan wet at all times. The fan is located downstream but up-grade from the sump so that most of the water does not pass through the fan but is drained into the sump by means of a Y in the duct at the sump. (3) Single duct systems with or without filters, and employing ejectors and exhausters.

It has been our experience that respirable air can generally be maintained economically at most operations in industry by the use of carefully planned exhaust ventilation systems. There is little excuse from the public health engineering viewpoint for the continued existence of air in industry which is contaminated sufficiently to be a health hazard to workers.

## HANDLING OF SOLVENTS

Specific examples of just what problems the industrial ventilation engineer may have to solve were discussed by Capt. S. C. Rotham in his paper "The Engineering Control of Some Solvent Hazards in War Industries," excerpts from which follow:

The broad over-all aspects of control and prevention of ill health resulting from the careless, ignorant misuse of industrial solvents can best be effected by mutually integrating the cooperative efforts of management, the worker, the community at large, industrial physicians, nurses, safety men and industrial hygiene engineers.

To emphasize the importance of engineering control, some of the apparent toxic effects of chemicals, especially solvents, will be reviewed.

The initial reactions of living, intact, human and animal organisms to foreign chemicals, which when introduced into the body may have a systematic effect (as opposed to a purely local action), are the same regardless of the structure or physical properties of the chemical. They are the same no matter what the route of absorption of the material. It seems quite possible that serious organic injury from harmful chemicals occurs more often as a result of an acute exposure of relatively short duration, superimposed upon the accumulated effects of a prolonged low grade exposure, than it does from individual, well isolated, acute incidents without the background of chronicity.

## SOLVENTS WIDELY USED

Time does not permit running the entire gamut of solvent hazards. Consideration, therefore, is devoted to a few of the most common types which are finding widespread use in war industries. The generally recognized hazards in the use of organic solvents are fire and explosion, bodily contact, and toxicity. In this paper, consideration will be given only to the possible control of toxic manifestations.

The engineering control of atmospheric contamination due to the misuse of toxic volatile solvents is primarily one of the most important functions of the industrial hygiene engineer and may best be

achieved by one or more of the following general methods: (1) substitution of less toxic materials, (2) isolation of those processes which produce contamination, (3) dilution with uncontaminated air, (4) control at point of generation or dissemination, (5) respiratory protective devices, and (6) maintenance, house-keeping, and education of the worker. To illustrate the specific application of these principles, a few important solvents have been selected and an attempt will be made to show by their typical usage how best their attendant hazards may be minimized in war industries.

Benzene (Benzol— $C_6H_6$ ): Benzene, an extremely volatile and inflammable solvent, is used as a basic material for the manufacture of aniline, picric acid and phenol. Under various trade names it is used as a substitute for toluol in paint removers. As a solvent in the coating and cementing of fabrics with natural rubber and other operations, benzene is utilized extensively. It is probably the best natural solvent or softening agent with or without the addition of some chlorinated hydrocarbons or a ketone, for example, butanone.

The cementing hazard referred to previously has been most effectively controlled by employing cements containing toluol or trade name processed petroleum which contain a large proportion of toluol and by

conducting the cementing on lateral or downdraft ventilated tables.

## METHODS WITH BENZENE

Inasmuch as the nitration of benzene is an enclosed process, the small amount of benzene liberated into the general room atmosphere have been kept at safe levels by means of: (1) roof ventilators with mechanically driven fans, and (2) by keeping the doors and windows open as much as possible. Workers making repairs on benzene nitration are required to wear gas masks (chemical-filter respirators) or U. S. Bureau of Mines approved (Type B Hose Masks) supplied-air respirators. Choice depends on the type of repair and duration of exposure.

Toluene ( $C_6H_5CH_3$ —phenyl methane, toluol, methyl benzene): Toluene is used in the manufacture of explosives, drugs, perfumes and dyes. Widespread use is made of it as a solvent for gums, resins, oils, and many types of cellulose esters. It is used in the lacquer coating for impregnating fabrics, paper and articles made of various other materials. In the aircraft industry it is used as a thinner in a special paint necessary for coating muscages, wings, etc., where application is by dipping and spraying. Due to the acute shortage of toluene, caused by its being diverted to explosive manufacture, several possible substitutes have been used by lacquer manufacturers and users. A petroleum product called hydrogenated naphtha, the aromatic content of which is much higher in the series than the straight run petroleum naphtha, offers an interesting possibility.

As a control in the nitration of toluene, the nitators are enclosed and connected to an acid recovery plant by means of a local exhaust ventilation system. Nitators are maintained under negative pressure sufficient to prevent the escape of toxic vapors into the room atmosphere during the nitration cycle.

Carbon Tetrachloride ( $CCl_4$ ) Tetrachloromethane: Carbon tetrachloride is a heavy, volatile, non-combustible solvent and extractant for fats and oils. Because of its non-combustibility it is used extensively in drug, chemical, rubber, paint, rubber cement and textile soap manufacture.

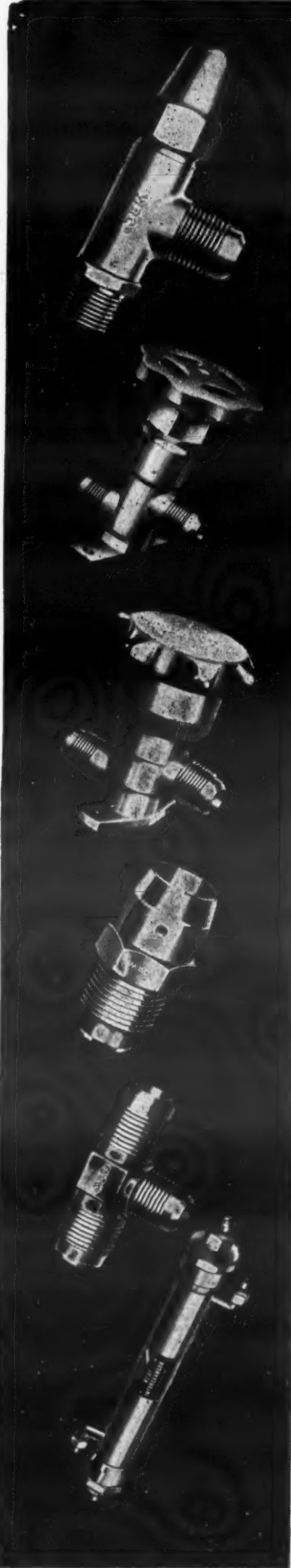
Twenty-five per cent carbon tetrachloride is used with a cutting compound in the critical tapping and machining operation of a gun plant. As an efficient substitute, 8%, less toxic, trichlorethylene was substituted.

According to the United States Public Health Service, the cause of illness among 135 employees in a Kentucky plant manufacturing parachutes was traced to carbon tetrachloride used in the cleaning of soiled spots on the chutes. First symptoms noted began coincidental with the beginning of the heating season and consequent reduction of ventilation in an effort to conserve fuel. The cleaning of these nylon parachutes is now being done with mild soap and water.

Solvent vapors of carbon tetrachloride are given off when tracer and ignited mixtures are charged into the copper jackets in explosive manufacturing. As precautionary measures the following are effective:

(1) sufficient general ventilation be

(Concluded on Page 30, Column 1)



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# War Workers Need Protection From Poisons & Germs In Air

(Concluded from Page 29, Column 5)  
provided, and (2) charging machines and dies be cleaned with either trichlorethylene, ethyl alcohol or coal oil instead of carbon tetrachloride.

## CONTROLLING CARBON "TET"

In the centrifugal removal of carbon tetrachloride from degreased objects, control is best effected by enclosing the centrifuge and exhausting the enclosure at a minimum of 100 cfm. per square foot of enclosure opening.

When carbon tetrachloride is used openly, as in a shop, ample ventilation should be provided and approved respiratory protection be furnished each man. Skin contact should be avoided.

Gasoline: Gasoline, because of its convenience and traditional usage, is used extensively for washing hands and arms. However, sufficient precautions are not taken to see that the gasolines used do not contain tetraethyl lead. Even as a good substitute for ordinary gasoline for washing and cleaning purposes, mineral seal oil, mineral spirit of various grades of naphtha may be recommended.

Serious exposures to lead are encountered in the spray cleaning with leaded gasoline of airplane motors after they have been tested. The use of tetraethyl gasoline for this purpose should be prohibited. Spray cleaning should be done in a small

room, cabinet or booth provided with mechanical exhaust ventilation rate at a minimum of 150 cfm. per square foot of room cross-sectional area or booth opening. As an added precaution the operator should remain always in the clean air upstream of the motor.

## DEGREASING INVOLVES SOLVENTS

Degreasing Solvents: The chlorinated compounds of petroleum, because of their non-inflammable nature and strong solvent action, are the most widespread solvents used in the degreasing of metals. The two principal ones today finding extensive use for this purpose are trichlorethylene (Perma-achlor, Triad, Tromex, Blascosolv), and perchlorethylene (Phillsolv, tetrachlorethylene).

Degreasing is usually accomplished by the dipping, wiping, vapor, spray, hot liquid-vapor or hot liquid-cold-cold-liquid vapor processes.

Based upon an engineering study of 108 degreasers, two authorities state that degreasing liquid cleans metal parts by (1) immersion, (2) spraying, or (3) vapor. Ninety per cent of all degreasers use two or more methods. According to the authorities, degreasers consist of a tank with a heating unit and condensing jacket, but in a recent development where tetrachlorethylene is used, there is no condensing jacket

and the temperature is controlled thermostatically.

Average atmospheric concentrations found were: 96 ppm. for ventilated condenser machines; 135 ppm. for non-ventilated condenser machines and 221 ppm. for non-condenser type machines. They attribute excessive concentrations to the following: (1) speed with which work is lowered into and removed out of the machine (manufacturers recommend 12 fpm.), (2) cooling beyond the dew-point temperature of the room, causing condensation and addition of water to the solvent, thereby lowering its boiling point, (3) not keeping work in the vapor zone until condensation stops, (4) poor arrangement of work in basket, (5) lack of temperature control of circulating water, which should be below 110° F., and above all (6) operation by inexperienced and unintelligent workers.

They recommend: hoists set at a maximal speed of 20 fpm. and withdrawal of work at same speed; equipment with thermostatic control of heating and condensing zones; proper design of basket; location of tanks in as large an area as possible, maintaining a minimum operative area exposed to air, a minimum freeboard distance of 0.6 of the tank width, careful maintenance of heat balance with every change in type and weight of metal, and prevention of dead air spaces in work.

## GREATER CARE WITH ANILINE

Small amounts of aniline have recently been added to commercial degreasing solvents as a substitute for the triethylamine which serves as a stabilizer. In view of the high toxicity

of aniline, greater care must be exercised.

In some cases attributed to solvent poisoning recently appearing in the literature, the workers so affected were engaged in cleaning a degreasing tank without proper breathing apparatus or life belts.

Generally speaking, from an engineering point of view, it might be added with a measured amount of confidence that few, if any, of the problems encountered have failed to yield their hazardous status to good, sound, practical, common sense applications.

There are three points that cannot be over-emphasized:

(1) Industrial solvents, generally speaking, are capable of entering the human body by skin absorption as well as by mouth or inhalation. In attempting control, therefore, all these vital possibilities should be considered by the engineer.

(2) In addition to knowing the physical, chemical, corrosive or explosive properties, the engineer must familiarize himself with the chronic as well as acute toxic results anticipated from ignorant excessive use of these substances.

(3) That all solvents, regardless of their toxicity, unless proven otherwise, irrespective of their mode of entry into the human organism, are foreign to the metabolic function and as such contribute no end to the accident proneness of the individual.

Although industry is more concerned at present with the elimination of toxic gases from the air in factories, the time may come when much attention will be given to prevention of the spread of illness through air transmission.

## AIR STERILIZATION STUDIED

A study on "The Use of Glycol Vapors for Air Sterilization and the Control of Air Borne Infection" was presented at the A.S.H.V.E. meeting by Prof. B. H. Jennings of Northwestern University, Dr. Edward Bigg of Northwestern University Medical School, and F. C. W. Olson, research associate at the university, will be of interest to industrial ventilation engineers.

Excerpts from their paper follow: The toll of air borne disease presents perhaps the largest tax on one's comfort and productive effort. Respiratory infections are responsible for an annual loss of more than 100,000,000 man days in American industry. Control and reduction of this waste represents a real challenge to engineers and physicians.

The concept of the spread of disease by the aerial route is not new, but it was not until recently that cumulative evidence has produced substantiation of this theory. Much of the credit in this field must go to the fundamental work of Prof. W. F. Wells, who showed that droplets delivered from the respiratory tract by coughing, sneezing or talking, evaporate rapidly and become droplet nuclei which float in the air for long periods, finally settling to the floor in the room. Here they adhere to dust particles and can again be set into motion by air currents. The development of simple, yet reliable devices for quantitative collection of bacteria from the atmosphere has also simplified and furthered bacteriologic studies on this problem.

## CONTROL OF AIR BORNE DISEASE

Air borne disease may be controlled by three methods: (1) Production of immunity in exposed individuals by vaccines, serums, drugs, etc., (2) prevention of introduction and dispersal of disease-bearing organisms into the atmosphere, (3) reduction in the number of organisms in the air of enclosed spaces.

It is obvious that frequent air exchanges in a space will, by dilution, reduce the total bacterial contamination of the space. This is the commonest means of bacterial control in use. However, in addition to the fact that the method is not positive there are limits to the number of air changes possible. Filtering and electric precipitation of dust and organisms in air also reduce contamination but fail to achieve complete control.

The bactericidal activity of ultraviolet irradiation is well established. If micro-organisms are exposed to the direct action of the rays, death is quickly produced. There are, however, certain objections to the widespread use of this means of air sterilization. Since exposure of the skin and eyes to ultraviolet rays may produce undesirable effects, individuals in the treated space must

be shielded from the direct rays. This necessitates irradiation of only those zones in which the rays can be directed without interference with the persons in the room. Although the bacterial content of such zones is lessened, there is a remaining area in which direct droplet infection may occur and in which the bacterial counts are high. The total effect is nevertheless a reduction in air contamination since air currents ultimately expose all the air to the irradiated area.

The use of ultraviolet lamps is further restricted by cost of installation and operation. The elements must be changed at intervals because after a certain period the wavelengths of the emitted rays are no longer bactericidal. Greatest no longer bactericidal.

## GLYCOL HIGHLY EFFECTIVE

Recently the glycol group of compounds in vapor form have been found to be highly effective agents for air sterilization. Although all glycols possess killing power in varying degrees, propylene glycol (PG) and triethylene glycol (TEG) fulfill most completely the criteria for widespread use. These materials had been used industrially as solvents and dehumidifying agents for many years, but it was not known that they presented any germicidal value. In fact, they exhibit relatively low bacterial activity in test tube experiments. However, when dispersed in the air, minute quantities in vapor form exhibit a dramatic killing action.

The problem of putting glycol vapor into the air can be solved in several different ways, one of the most satisfactory of which was found to be by vaporization from an aqueous solution. TEG is extremely hygroscopic and miscible with water in all proportions. As is truth of miscible binary mixtures, the temperature at which boiling takes place varies with the concentration of the particular mixture.

In all authors' field tests a vaporizer was used. The first tests were made using a laboratory model vaporizer, but the later tests were made with a commercially manufactured vaporizer made to authors' specifications. This consists of a double shelled unit with the space between the shells filled with suitable insulation. The vapor is discharged from a pipe which attaches into the vapor space of the unit just beneath a removable top. This outlet can be piped to lead the vapor into a duct system or if the vapor is delivered in front of a fan it can be distributed by air currents.

## OPERATION OF UNIT

An indicating thermometer is placed at the lower front of the unit and above this is a 1,000 watt immersion heater. To the right of the heater is a temperature control switch which is adjusted to open the solenoid valve. Thus when the temperature rises to a certain point, indicating that the water concentration in the solution is too low, this switch opens the solenoid valve, which remains open until the boiling temperature drops to a low enough point for the temperature control switch to operate and close the solenoid valve. At the left of the heater element is a high-temperature safety cut-off switch to protect the vaporizer from overheating. Near the top in a central location can be seen a high-level liquid float control which trips the electric circuit in the event that the liquid level becomes too high. Below this is a manual reset which has to be used to put the unit back in service when either the float switch or high-temperature cut-off operates. A gage glass to show liquid level is attached.

There is a certain point at which glycol vapor will be sufficient in amount to saturate completely the atmosphere. Above this point if additional quantities of glycol are present they must exist in suspension in a foglike condition. In the case of the atomizing device the amount of vapor which passes into the air will depend upon the air temperature, and a fog in the treated space would not arise unless the air temperature leaving the atomizer drops appreciably.

Tests conducted in eight large dormitories, each containing approximately 80 men, indicate that glycol vapors are effective in reducing the number of bacteria in the air. Studies of hospital records showed that there was a "noticeable reduction of infections" from air-borne germs among the occupants of the dormitories subjected to the glycol vapors, the authors declared.

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## Cooling Ups Spot Welding Efficiency 100% In Production of Aircraft Skin Sheets

By James B. Smith

DETROIT—An average increase in spot welder efficiency of nearly 100% over an 18-month period has resulted from the use of mechanically refrigerated welder tips in the production of aircraft skin sheets at the three plants of the Briggs Mfg. Co., Detroit aircraft subcontractor.

When the giant automotive body plants were converted to the production of aircraft parts early in the war, use of spot welding was decided upon as the fastest and most economical method of producing wing, aileron, and tail surface skins because of the tapered shape of the surface coverings and the high wasteage involved in cutting rolled aluminum sheet to size.

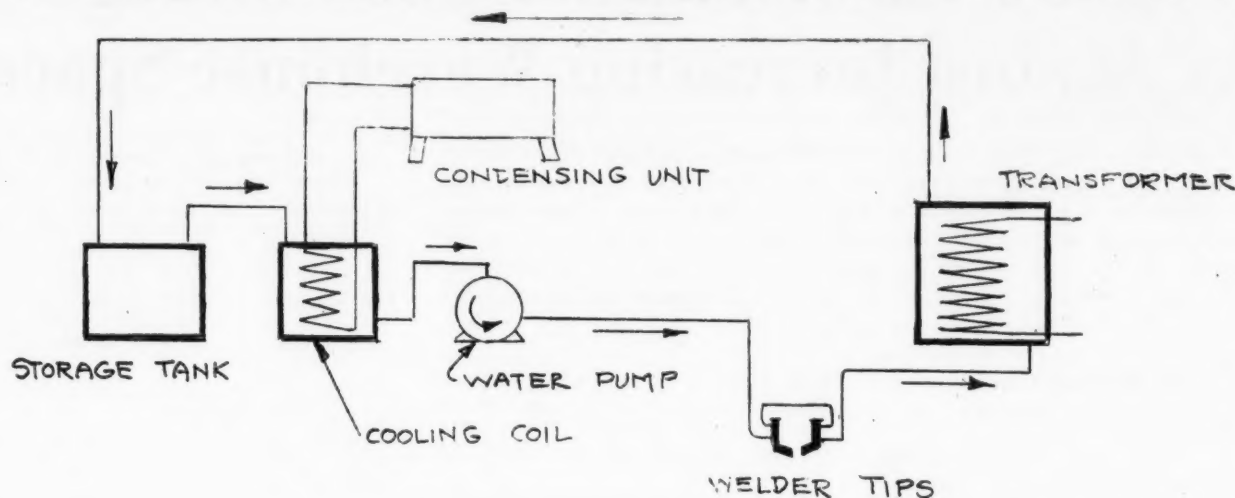
Early efforts at skin welding using unrefrigerated water proved highly complicated, however, because of the

of tip dressing has been reduced sharply. Added together, the savings have resulted in nearly doubled output from the welding units.

One of the unforeseen but highly important advantages attributed to the use of recirculating water coolers has been the solving of both water consumption and disposal problems. Using city water, unrefrigerated, the 31 welding units in this plant would have consumed nearly 125,000 gallons of water in each 24 hours of operation, based on a usage per welder of slightly over 150 gallons per hour.

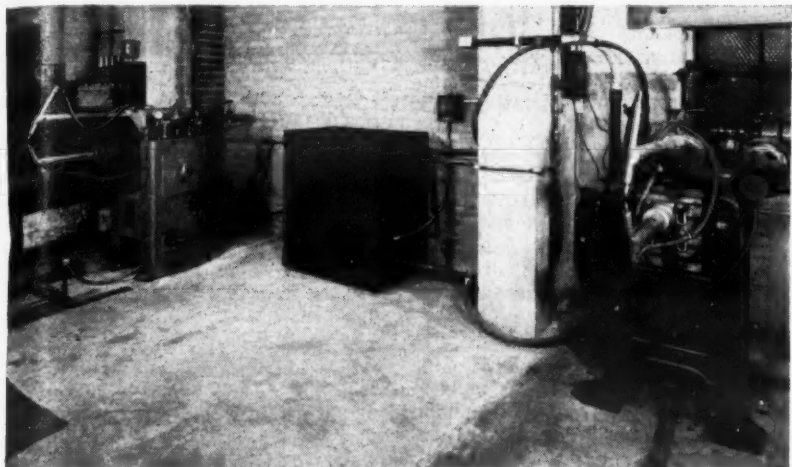
Using the mechanically cooled water, flow has been reduced to slightly under 120 gallons per hour, practically all of which is recirculated, with a net usage in each 24 hours of approximately eight gallons

## Refrigerated Water Circuit In Typical Spot Welder Tip Cooler



Schematic layout showing circulation of water through welder tip and transformer coil cooling circuit in Temprite installation on spot welder units at Briggs plant.

## Two Welders Cooled By Single Unit



Multiple Temprite welder tip coolers in typical small war plant in Detroit area. In this installation alcohol instead of water is used as the cooling medium, and tip temperatures are held at 0° F. for welding aluminum alloy sheets.

availability of the water, especially during summer months, to cool the welder tips efficiently. Even with a flow of more than 150 gallons of water per hour through the welder tips, very frequent tip dressings and almost as frequent "cooling" periods were necessary.

In addition, burning of aluminum occurred on the average welder as many as 100 times each day. In such instances, the burned area fell out of the sheet surface entirely, leaving a hole in the metal which had to be filled with special rivets, sized to fit the hole, and in some cases the entire section had to be discarded entirely with a sacrifice of both the critical alloy metal itself and all the labor which had gone into it up to the time of the inspection.

At one of the plants, typical of all three, a battery of 31 Temprite water cooling units, powered with 1½ hp. Airtemp condensing units, was installed. Burning of the metal dropped from 100 to an average of one spot per day, "cooling period" waits were no longer necessary, and the safety hazard resulting from occasional flying of burned assemblies from the welder tips was eliminated. In addition, frequency

for the complete battery, as against 125,000.

Each welder is equipped with an overhead cooling unit, suspended on stay-supports approximately five feet above the back of the welding machine. Incoming city water flows into a three gallon storage tank from which it is passed by a ¼ hp. positive pressure circulating pump through a double coil Temprite instantaneous cooler. From the cooler, water is circulated through flexible lines to the welder tip, then through the welder transformer cooling jacket, from which it returns to the storage tank.

Initially, the water is cooled at 38° F., and rises to approximately 46° by the time it has completed the cooling circuit.

To facilitate welder tip changing without shutting down the system, a bypass valve is located in the supply line between the circulating pump and tip section. When the tips are changed, water is routed through the bypass circuit back to the water storage tank, permitting continuous operation of the transformer hookup during tip changing periods.

## Kansan Suspended for Violation of L-38

WASHINGTON, D. C.—Suspension of priority assistance for a period of three months—from June 24 to Sept. 25—has been ordered against George T. Estfan of Wichita, Kans., for violation of Limitation Order L-38, the WPB reported last week.

WPB alleged that Mr. Estfan, who does business as the G.T.E. Co., sold some half-dozen units on unrated orders that should have borne a preference rating or been authorized by WPB.

## Miller Advertising Head In Goodrich Division

AKRON, Ohio—Jay E. Miller, sales promotion manager, industrial products and sundries division of The B. F. Goodrich Co. since 1943, has been named advertising manager of the division in addition to his present duties, it is announced by H. E. Van Petten, manager of B. F. Goodrich advertising.

Miller has been with B. F. Goodrich since 1936 and was advertising and sales promotion manager of the sundries division until last year.

## Davison Chemical Wins Nat'l Security Award

BALTIMORE, Md. — For "extraordinary achievement in establishing and maintaining superior security and protection measures against avoidable accidents, fire, and enemy air raids," Davison Chemical Corp.'s Curtis Bay Works has received the National Security Award.

At presentation ceremonies employee and management representatives were given the award and pins by William G. Ewald, executive director, Maryland Council of Defense.

HERE'S THE

*INSIDE* STORY



## ON *Anaconda* DEHYDRATED COPPER REFRIGERATION TUBES

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assures a clean, dry, interior surface, reduces waste (the depth of the cup is no greater than the diameter of the tube). With the exclusive cup-seal, the tube may be threaded through a small opening, or may be formed or bent before the sealed ends are cut off.

Anaconda Copper Refrigeration Tubes are available in all standard sizes up to and including ¾" O.D. They are stocked by jobbers in coils of 25, 50 and 100 feet. Longer lengths can be supplied on special order.

\*Patent Applied For



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# Senators Favor Smaller Food Storages As Against Increasing Warehouse Space

**Editor's Note:** This is the second instalment of a digest of the recent hearings of a U. S. Senate Subcommittee on the matter of expanding the program for new refrigerated locker plant construction. These reports hold much of note for the refrigeration field, first, in revealing the great interest of the Senators and the government agencies in the preservation of foods by freezing; second, in showing up the factors that prevent the production of more refrigeration equipment.

## Asks for Comparison of Can Vs. Frozen 'Quality'

**Sen. Aiken.** Have you any information as to the percent of spoilage of food which is processed by the quick-freeze method as compared with the percentage spoiled in the home canning process?

**Mr. Hill.** Senator, there is practically no wastage in the quick-freezing of meat. There is practically no wastage in that, because when you get it frozen and keep it that way, you have it, and you always have some spoilage in canning.

**Sen. Aiken.** Yes, I know that is particularly true in vegetables.

Is it true that when fruits and vegetables are processed by the quick-freezing process that the qualities are retained? By that, I mean the vitamins or the resistant qualities of these vegetables, of these foods, are retained by the quick-freezing process?

**Mr. Millard.** Our experts have told us that it is a much better method of preserving.

I am talking now about the average home canning as against what happens in the quick-freezing plant. I do not know the comparison of commercial plants.

**Sen. Aiken.** Can you tell us about

how much food the average family would store in the average locker during the year, assuming the average turnover of so many times a year in that space?

**Mr. Robinson.** 500 pounds per locker.

**Sen. Aiken.** About your advice as to the requirements to be met by applicants for frozen food lockers which become effective tomorrow, I notice on page 3, about the middle of the page, you have a definition of the word "producer."

"The word 'producer' as used in this instance shall mean:

"1. Persons who are resident operators of farms producing the kind of food normally stored in lockers and derive their principal income from farm operation.

"2. Persons who reside in town but who supervise the operation of a farm by a tenant on a share basis or by hired labor producing the kind of food normally stored in lockers and who derive their principal income from the operation of such farm or farms."

Restricting the definition of "producer" which is necessary to qualify, with the exception of 20%, in restricting them as you do, is that not going to make it almost impossible for a lot of communities that need these plants to qualify for it?

**Mr. Millard.** We would have liked to have the advice of your committee on this rule, and these rulings.

If we had an approved program for 2,000 plants we would not need to worry about rules. But when we get a request for 2,000 or 3,000 plants, and if we only have 300 or 450 plants to provide, you have to devise some kind of rules that will make for the distribution of the available plants on an equitable basis.

Locker plants will save more food that would otherwise be wasted, if they are in farm communities.

They are a greater service there than in the city communities, in the cities where they are going to have normal and pretty good distributive systems and furnish fruits and vegetables and meats through distributive systems which will take care of them by commercial refrigerator warehouses.

In the rural districts, if they do not preserve their food at the time it is grown or produced, it is lost. There they do not have these fine commercial systems to deliver. These plans were drawn with two ideas in mind:

1. A general way of selecting 300 or 500 plants who would qualify as proper claimants.

2. To concentrate them in the rural areas.

At the present time, 84% of the lockers that we have are in towns of under 10,000.

## Senator Believes Locker Storages Better Plan

**Sen. Aiken.** Mr. Millard, in your opinion, is it impracticable to get this material from somewhere to expand existing so-called cold storage plants for the period of the emergency, is it more impractical than it is to permit that material to be used for community locker plants and farm home freezers that would be used to the same capacity after the war—it appears to me—unless the government wants to stand the expense, it seems to me that the cold storage plant operators are going to be rather reluctant to double their capacities or increase them appreciably, knowing that after the war they will not have a need for it?

**Mr. Millard.** That is one of the problems that you are faced with.

**Sen. Aiken.** Would it not be more sensible to use this material where it will be used constantly after the war?

**Mr. Millard.** I would hope that both programs would go forward together. It seems to me that they serve separate but equally important purposes.

**Sen. Aiken.** Has there been much extension and expansion of the so-called ordinary cold storage facilities during the past year?

**Mr. Millard.** Mr. Hill put in this record the figures showing that there was an increase last year of 10%, and this year's present indication is an increase of 15% in the commercial cold storage capacities.

**Sen. Aiken.** There is no assurance that they will be required after the emergency?

**Mr. Millard.** There is some indication of that, sir, in that the people who are applying for this space are asking for their tax amortization certification on this type of construction on the basis of five years.

**Sen. Aiken.** If I were a cold storage operator I think I would want to take no longer than five years.

**Mr. Hill.** A great many of the storage houses will be in that condition.

## Sees More Use For Increased Locker Space After War

**Sen. Aiken.** If this material was allocated to quick-freezing facilities for the smaller communities there is no reason to doubt that they would not be used.

**Sen. Aiken.** Going back to these new requirements which will go into effect June 1, 1944, I can see where I would want to make one suggestion.

**Mr. Hill.** We would welcome it.

**Sen. Aiken.** That is, you restrict this to the operators of farms. I do not see any provision for farm labor. Now, a man that works on the farm usually gets his half-hog and a lot of his other produce from the farm where he works. It seems to me that he should be entitled to locker space just as much as the operator of the farm.

**Mr. Hill.** I will ask Mr. Millard to answer that.

**Mr. Millard.** We surely want that liberally interpreted so that any Victory gardener or average farm producer who can capitalize on his spare time and produce food will have a place to store it. It should be so interpreted. That was the intent.

**Sen. Aiken.** He could not qualify under this definition, could he? It says "and who derive principal income" from farm operation.

**Mr. Hill.** I will ask Mr. Robinson as to that.

**Mr. Burns.** I can explain that.

## Burns Explains Requirements For Those Who Rent

**Arthur E. Burns, Assistant to Director, Office of Materials and Facilities, War Food Administration.**

**Mr. Burns.** I can explain that. The producer, as defined there, has to constitute in the small town, 60% of the total renters of the lockers; in the larger town, 50 to 75%.

So, in the large town, 25% of the renters would be the Victory gardeners or workers with small plots. It is not necessary for them to derive their main income from farming.

In the small town it would represent 40% of the renters who may be the type of person you have in mind. So, the regulations do not exclude these people. They merely provide that from 60 to 75% of the renters must be food producers.

**Sen. Aiken.** I think there has been some misunderstanding about that, especially in my own state of Vermont, anyhow. I have received many letters by people who contend that they could not qualify at all, because they had already been sent out, these instructions to people in the villages where their production was not so great, they are producing in their own gardens vegetables, or they are producing some of their own meats and other things and then they are purchasing some of their meats and other things from farmers living outside of the town in addition to what they produce themselves.

You do expect to interpret that provision so that it will permit them up to 40% of the renters in the small towns to be non-farmers?

**Mr. Burns.** That is right.

**Mr. Millard.** Sen. Aiken, we would be clear out of the difficulty if we could find a way to get more than our present allotment of locker plants built, to a sufficient number that would permit us to take care of this growing problem. That is one of the fundamental things here.

With that thought in mind, I wonder if you would like to hear from the WPB men what the opportunity is going to be to get them?

**Sen. Aiken.** I understand that you have the idea in mind that if we had a program of, say, 2,000 plants that would pretty well take care of the situation and allow all of the communities who could really use them to advantage to get them.

**Mr. Millard.** That is true.

## Smith Lists Approvals by Geographical Sections

**Statement of Frederick Smith, Special Equipment Branch, War Production Board.**

**Mr. Smith.** I have a record here of the cases that have been approved by the various regions.

I believe the WFA, prior to the

## Those Who Appeared Before Committee

Present before the subcommittee:

Grover B. Hill, First Assistant Administrator, War Food Administration;

J. W. Millard, Director, Office of Materials and Facilities, War Food Administration;

Arthur E. Burns, Assistant to the Director, Office of Materials and Facilities, War Food Administration;

Frank K. Wooley, Chief of the Processing and Facilities Branch, Office of Materials and Facilities, War Food Administration;

Lee R. Robinson, Assistant to the Chief of the Processing and Facilities Branch, Office of Materials and Facilities, War Food Administration;

John B. McTigue, Head, Facilities Bureau, War Production Board;

Sterling Smith, Chief, Refrigeration Section, War Production Board;

Frederick Smith, Chief, Special Equipment Branch, War Production Board;

Peter Bove, Counsel for the National Frozen Food Locker Association Manufacturer and Suppliers, Chicago, Ill.; also certain Vermont Farm Cooperatives.

first of February, approved 255 cases, and on the first of February the processing of these cases was decentralized and put in the hands of the regional branches of the War Production Board.

Now, from the time that the field officers took over the processing of these and the criteria was set up by the War Food Administration, a total as of yesterday of 275 applications have been approved.

Following is a breakdown of these by WPB regions:

Boston region, 11 approvals.  
New York region, 20 approvals.  
Philadelphia region, 8 approvals.  
Atlanta region, 23 approvals.  
Cleveland region, 21 approvals.  
Chicago region, 49 approvals.  
Kansas City region, 53 approvals.  
Dallas region, 23 approvals.  
Denver region, 11 approvals.  
San Francisco region, 17 approvals.  
Detroit region, 9 approvals.  
Minneapolis region, 24 approvals.  
Seattle region, 6 approvals.

There were a total of 189 applications denied for failure to meet the requirements set up by the War Food Administration.

**Sen. Aiken.** What are the principal causes of failure to qualify?

**Mr. Frederick Smith.** Either lack of having enough qualified producers or within the mileage limit set, that is, where they have been too close to an existing plant; or, failure to meet any one of those requirements that the War Food Administration set up as being eligible.

**Sen. Aiken.** What do we have in the way of pending applications?

**Mr. Frederick Smith.** There are pending applications, 156 applications which had met the essential requirements of the War Food Administration.

So, as of yesterday, there have been approved 530 applications.

(Concluded on Page 33, Column 1)

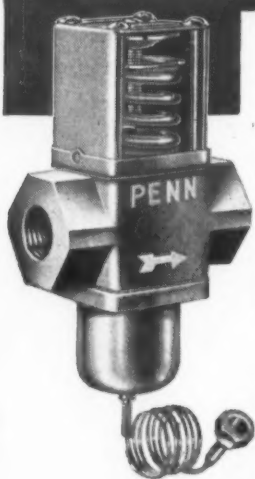
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## Increased Demands For Refrigeration Equipment Revealed To Senators

(Concluded from Page 32, Column 5)  
And this year, as of today, there are 189 denied.

There have been and are 156 pending for processing or release in the third and fourth quarters.

Sen. Aiken. In other words, you have assumed that a goodly percentage of the 156 that are pending will be approved, just about used up the year's allocation of locker plants?

Mr. Frederick Smith. It will pretty nearly use it up, I assume.

Sen. Aiken. In five months?

Mr. Frederick Smith. Yes.

When the program was approved originally, I think we stated 550 plants, but the limit, in reality, was set at a total dollar value of refrigeration equipment which was \$1,320,000 of refrigeration equipment.

We assume that if that equipment went into a complete new plant, we would get approximately 550 plants of an average size of 375 to 400 lockers per plant.

There have been some additions granted to existing plants. There have been some small plants approved. Therefore, this figure of \$1,320,000, out

of this \$1,320,000 we will probably get maybe 600 or 700 plants, depending on the size.

The only restriction on that program was that the application for the installation meet the requirements set up by the War Food Administration and one other provision that until Oct. 1, at least, no "Freon" be approved for locker plant application due to the scarcity of "Freon" gas.

However, many of the methyl chloride installations could be approved—in answer to the question that was raised earlier, that is, if it were possible to convert back at a later date, yes, the methyl chloride systems could be converted to "Freon" where methyl chloride had been used originally.

However, a system originally installed with ammonia can not be converted to "Freon," but will have to remain ammonia.

It might be interesting, also, in view of the previous discussion, to review the current situation as regards machinery requirements on the refrigeration proposition, in the refrigeration industry.

### Present Limiting Factors Described by Fred Smith

The limiting factor a year ago was definitely raw materials.

Today, the limiting factor is still raw materials to a certain extent—I am speaking of carbon steel, copper, copper alloys, and so forth.

However, the most important limiting factor today is the components going into the complete refrigeration system.

I will give you some figures in a minute of the delivery dates on certain critical components going into a refrigeration system.

As far as the refrigeration industry is concerned, the military requirements today are slightly higher in total dollar value than they were a year ago.

The Army requirements have dropped.

The Maritime requirements are slightly ahead of a year ago.

The Navy requirements are almost twice as much as they were a year ago. This is due, primarily, to the landing craft program, submarine program, and other shipping programs.

The Air Corps, which is a relatively small unit, is about the same.

Sen. Aiken. What about those Federal Housing Program requirements? Do you have charge of the granting of priorities for that?

Mr. Frederick Smith. Most of them are household refrigeration, which would not be handled by our branch.

Sen. Aiken. I understand that very large numbers of household refrigerators have been installed in some of those Federal Housing projects. There, it is simply unused, whereas civilians can not buy refrigerators at the present time.

I have not followed the report technically, but it has been called to my attention, I think, that in Johnsonville, Pa., there was a project of 900 family houses that are supposed to have refrigeration in there. The place is locked up, the refrigerators are not available to anybody, whereas there are war workers who live in their own homes and perhaps ride 10 miles to 15 miles per day to work in war industries, and simply are unable to buy refrigerators.

I realize that is beside the point at this hearing, but I do not know but what you had something to do with it.

Mr. McTigue, No, that is handled by the Consumer Durable Goods Division of WPB.

Sen. Aiken. The Consumer Durable Goods Division?

Mr. McTigue. That is right.

Mr. Frederick Smith. That is right.

Mr. Sterling Smith. It is not in our Branch.

Sen. Aiken. If that is true, it seems to me that we should have another hearing.

### Why Dollar Volume Yardstick Is Used

Sen. Gillette. In connection with the information that Mr. Smith is giving, I notice in your comparison to military requirements, Mr. Smith, you use an expression of dollar volume, and also in your statement as to allocations that were being made, or

had been made you again used the expression as to dollar volume. You spoke of so many dollars that you had to spend.

In view of the fact that the question has been materials and the availability materials or component parts, what is the logic of using a yardstick of a dollar value in making up these comparisons and in determining these allocations.

Mr. Frederick Smith. In refrigeration equipment, if I may explain it to you, Senator, there is a constant relationship between dollar value, at manufacturer's cost of refrigeration plants today, to the amount of steel, copper and other raw materials going into that equipment.

In other words, from bills of material which we have assembled for manufacturers on the locker program, it amounts to \$1,320,000 worth of finished machinery.

We have set up this thing under 3,000 tons of barbon steel.

10,000 tons of alloy steel.

Copper tubing, 26½ thousand pounds.

Copper rods and bar copper alloy, 20,000 pounds, and so forth and so on.

Sen. Gillette. Are you limited in the funds that you can expend or approve for the purchase of these materials? Is that the dollar limitation that you have to follow? Is that correct?

Mr. Frederick Smith. There is approved \$1,320,000 worth of refrigeration equipment.

Sen. Gillette. Yes. That is exactly what I want to inquire about. Why is it that a dollar limitation is fixed rather than the need and availability of materials? Who said to you, "You can spend \$1,320,000 for refrigeration equipment?"

Mr. Frederick Smith. We originally requested a given quantity of material which is allocated to us. Now, in—

Senator Aiken. (interposing) If I may interrupt—from whom?

### Essential Civilian Needs Have Shown Big Increase

Mr. Frederick Smith. From the Requirements Committee of the War Production Board.

Sen. Aiken. What follows next?

Mr. Frederick Smith. From the Requirements Committee of the War Production Board, and the next thing is how much refrigeration machinery will be produced out of this material which is costing that much money.

We estimated from these bills of material that it was approximately \$1,320,000 at manufacturer's price.

As the applications are filed always on a dollar basis, this is the easiest way for us to keep control.

We know from past experience that material and dollar value have a constant relationship in any given product. It varies between products, but as far as refrigeration equipment is concerned, Senator, it is very constant.

I might add further, Senator, that while the military requirements have remained approximately the same for the last three or four quarters, the anticipated business of the refrigeration industry in the second quarter of this year is about 25% greater in output than it has been for the first quarter of 1944, or the fourth quarter of 1943.

Sen. Aiken. What became of this output? What is the reason for this additional output?

Mr. Frederick Smith. The additional output is going either to War Food Administration projects, or civilian requirements projects, requirements for equipment that is wearing out, and things of that kind.

In the past two quarters, aside from



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the locker plants program, there has been a substantial amount of equipment produced and released for the conversion of cold storage space to freezer space to help out this situation.

There has been an expansion in the ice plant industry to produce more ice in areas where civilians were lacking ice last year. It was necessary to transport ice in from the outside.

So, in general, the refrigeration industry is taxed more now, as far as productive output is concerned, than before.

Sen. Aiken. The increase in output due to lack of help, has been lowered?

Mr. Frederick Smith. In many, many communities.

Sen. Aiken. And many communities have been unable to get help to make the ice?

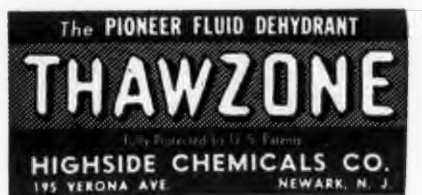
Mr. Frederick Smith. Yes, sir.

(To Be Continued)

### Mueller Earnings For Quarter \$270,333

PORT HURON, Mich.—Mueller Brass Co. has reported net earnings for the quarter ended May 31, 1944 of \$270,333, equivalent to \$1.02 per share, after deducting \$636,500 for estimated Federal income and excess profits taxes. For the same quarter last year Mueller had a revised net of \$321,445, equivalent to \$1.21 a share, after \$794,000 for Federal taxes.

For the six months ended May 31, the company netted \$520,279 (\$1.96 a share) after \$1,261,500 for estimated taxes. In the first six months last year, Mueller netted \$624,415 (\$2.35 a share) after \$1,520,000 for Federal taxes.





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## Servicing the G-E Refrigerator Line

### Relay Replacement

Regardless of the original type of relay, the Type R Relay should be used as a replacement on CA and Scotch-Yoke Machines. For relay location, see Figs. 2 and 3.

#### TO REMOVE RELAY

##### CA & SCOTCH-YOKE MACHINES WITH TYPE E-3 RELAY

1. Twist locking connector plug and pull from base of relay.
2. Remove relay cover by taking out cover screw.
3. Disconnect leads to relay terminals. Mark them if colors are not distinct.
4. Remove relay mounting screws.
5. See "Installation of Replacement Relay."

##### SCOTCH-YOKE MACHINES WITH TYPE E RELAY

1. Remove relay mounting screw



Fig. 45—Type E-3 relay.

- at top, and nut at bottom where one is used.
2. Disconnect leads to relay terminals.
3. See "Installation of Replacement Relay."

##### SCOTCH-YOKE MACHINES WITH TYPE N RELAY

1. Remove wing nuts on U-bolt.
2. Lift off strap across U-bolt.

3. Remove terminal cover and disconnect leads.
4. See "Installation of Replacement Relay."

##### SCOTCH-YOKE MACHINES WITH TYPE R RELAY

1. Pry off spring clip or remove U-bolt.
2. Disconnect leads to relay terminals.
3. See "Installation of Replacement Relay."

##### INSTALLATION OF REPLACEMENT RELAY ALL CA & SCOTCH-YOKE MACHINES

1. Use Type R Relay with proper catalog number.
2. Refer to Table 7 for relay wiring connections and connect leads to relay terminals.
3. Mount relay in vertical position with two cable outlets downward.
4. Use required accessory equipment when installing R relay as a replacement for E or N relays. Also remove locking connector plug from connecting cord on the machines originally equipped with E-3 relay.

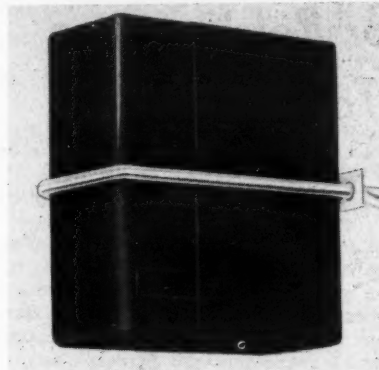
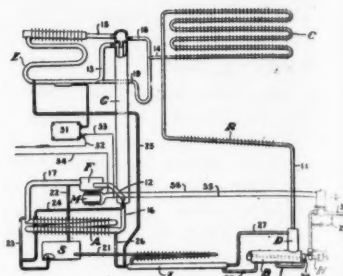


Fig. 47—Type N relay.

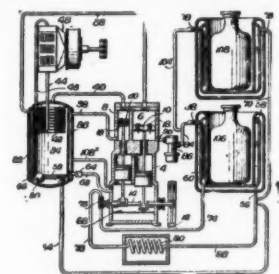
bers of the frame having portions arranged for interengagement with the first and second shelf sections respectively to support said sections in the horizontal plane, means providing clearance between said second section and the portions of the said side members which support the first section so as to permit movement of the second section to a folded position immediately underlying the horizontally disposed first section, in which position the portion of said effective shelf area normally occupied by the second section together with the space below said effective area is left free and substantially unobstructed by said section, and means for supporting the second section in said underlying folded position.

2,352,472. REFRIGERATION. Curtis C. Coons, North Canton, Ohio, assignor to The Hoover Co., North Canton, Ohio. Application June 12, 1940. Serial No. 340,038. 5 Claims. (Cl. 62-119.5).



1. In an absorption refrigerating system involving an evaporator and an absorber connected for circulation of an inert gas therebetween, a generator, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid refrigerant to said evaporator, means connecting said absorber and generator for circulating an absorption solution therebetween, said generator comprising an elongated tubular body having a heating flue extending lengthwise through, a combustible fuel burner positioned to discharge products of combustion through said flue, an analyzer extending above the opening into the top portion of said generator body adjacent the end thereof which receives products of combustion from said heater, said means connecting said generator and said absorber being arranged to supply strong solution to said analyzer and to withdraw lean solution from the bottom end portion of said generator body remote from said analyzer, and a circulation conduit including a portion extending lengthwise of and in said flue connecting the bottom central portion of said generator body to the top end portion thereof remote from said analyzer.

2,352,581. METHOD OF REFRIGERATION. Joseph F. Winkler, Philadelphia, Pa. Application July 11, 1941. Serial No. 401,899. 2 Claims. (Cl. 62-178).



1. The method of producing low temperature refrigeration which includes liquefying a mixture of ethane and propane in a closed circuit at a temperature of about 90 degrees F. and at a pressure of about 150 pounds per square inch in a first zone of said circuit, vaporizing (Concluded on Page 35, Column 3)

Table 6—Accessory Parts Required R Relay Replacing N or E Relay

Original Relay	Machines	Access. Set Cat. No.	Mount Replacement R Relay to
N	CE	M15A25 & M15A21	Original bracket with U-bolt. Assemble wing nuts in front.
	CF	M15A27 or M15A25	Compressor fins with clip. Original bracket with U-bolt.
	CH CJ	M15A25	Original bracket with U-bolt.*
E	CE-34M	M15A31 & spacer	Plate behind original bracket with clip.†
	CF	M15A27	Compressor fins with clip.
	CH CJ	M15A31	Plate below original bracket with clip.
	CK DK	M15A28	Bracket with U-bolt.
E-3	CA-1A CA-2A	M15A75	Plate with clip.
	CA-1B CA-2B	M15A32	Plate with U-bolt.
	CK-30B CK-35B		
	LK	M15A28	Bracket with U-bolt.‡

\*Enlarge holes in bracket with a file.

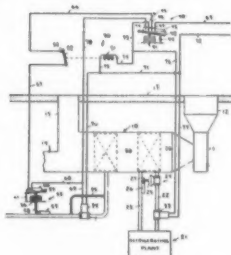
†Plate is mounted upside-down and a 1/4-inch spacer must be used between plate and bracket.

‡Drill 3/16-inch hole in lower part of bracket.

## PATENTS

Weeks of June 27, July 4

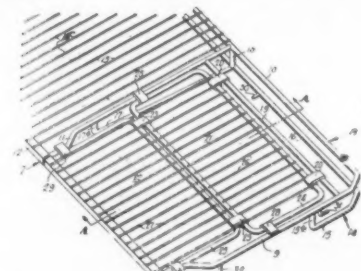
2,352,282. STAGE CONTROLLED AIR CONDITIONING SYSTEM. Alvin B. Newton, Minneapolis, Minn., assignor to Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.



Minneapolis, Minn., a corporation of Delaware. Application April 30, 1942. Serial No. 441,126. 12 Claims. (Cl. 62-6).

1. In an air conditioning system, in combination, air cooling means comprising artificial refrigerating means, means comprising a heat exchanger having a source of fluid supply therefor, and means responsive to cooling requirements for first operating the heat exchanger alone, then operating the artificial cooling means alone, and then operating both the heat exchanger and the artificial cooling means in response to increasing cooling requirements.

2,352,345. REFRIGERATOR. Theodore W. Bundell, Abington, Pa., assignor to Philco Corp., Philadelphia, Pa., a corporation of Pennsylvania. Application Nov. 24, 1941. Serial No. 420,307. 7 Claims. (Cl. 211-153).



5. In a refrigerator, a frame having spaced side members, a transverse member extending between said side members, complementary shelf sections carried by the frame and adapted in horizontal coplanar relation to afford an effective shelf area corresponding substantially to the combined areas of the said sections, one of the sections being joined to a second section to permit folding of said sections together along a line substantially parallel to said transverse frame member into substantially face to face relation and the first section being hinged to said transverse member for movement about the axis of said hinge between a position in the horizontal plane and an alternative generally elevated position in a more or less upright plane wherein the sections in said folded state are withdrawn to one side of said area, the said side mem-

### UNIVERSAL COOLER

MARION, OHIO  
BRANTFORD, ONTARIO  
WE SELL TO MANUFACTURERS ONLY  
UNIVERSAL COOLER CORPORATION  
Automatic Refrigeration since 1922

### MIDWEST

Household and Commercial Refrigerator Cabinets  
Now Making VITAL War Products for Army and Navy  
MIDWEST MFG. COMPANY  
COLUMBUS, OHIO

### CURTIS REFRIGERATION

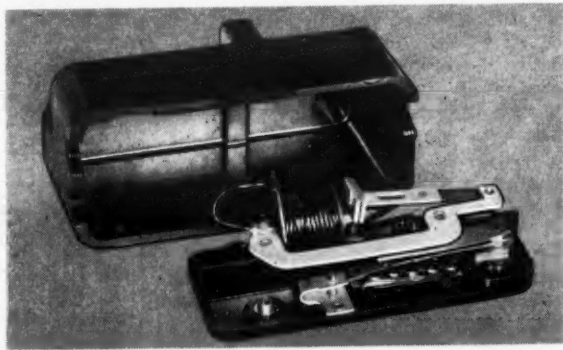
Established 1864  
AIR CONDITIONING AND COMMERCIAL  
Curtis Refrigerating Machine Division  
of Curtis Manufacturing Company  
1912 Kienlen Ave. St. Louis, Mo.

### 1944 Refrigeration Supply Catalog

Sent on request  
REFRIGERATION EQUIPMENT CO.  
101 E. 24th St., Kansas City 8, Mo.

### REFRIGERATION ENGINEERING Inc.

RESEARCH COILS WATER-DEFOST  
U.S. PAT. 2,319,393  
LOS ANGELES - CALIFORNIA



(Left) Fig. 46—Type E relay. (Right) Fig. 48—Type R relay.



Keep 'em Running with  
REFRIGERATION PARTS and SUPPLIES  
from Headquarters

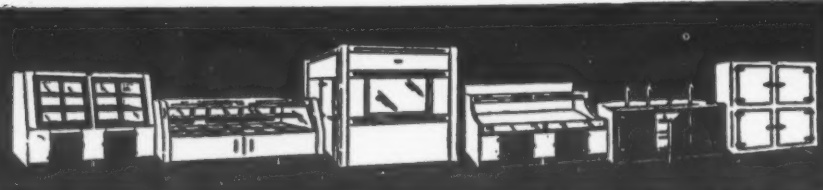
SEND FOR OUR CATALOG ON YOUR LETTERHEAD

### THE HARRY ALTER CO.

1728 S. Michigan Ave.  
Chicago, 16, Ill.

Two Big Warehouses  
to Serve You

134 Lafayette St.  
New York, 13, N.Y.



BUY BONDS TODAY AND PLAN FOR TOMORROW  
OUR POST-WAR PROGRAM WILL BENEFIT YOU!  
ASK US ABOUT IT NOW  
WRITE DEPT. 220

FOGEL REFRIGERATOR COMPANY, since 1899  
Philadelphia, Penna.

## "What's Joe Got That We Haven't Got?"



Ranco Replacement Controls give Serviceman Joe the edge on the other fellows. That is because Ranco offers many outstanding features that make them so desirable. For example: Ranco Controls are beautifully designed and sturdily constructed with stainless steel bases, top frames and side covers. The Overload Protection Unit gives accurate and consistent protection. They are precision made . . . alert, responsive, accurate and dependable. No wonder they are so welcome.

Ask your Jobber about available Ranco Controls

Ranco Inc. COLUMBUS, OHIO



## CLASSIFIED ADVERTISING

RATES for "Positions Wanted" \$2.50 per insertion. Limit 50 words.  
RATES for all other classifications \$5.00 per insertion. Limit 50 words.  
Advertisements set in usual classified style. Box addresses count as five words, other addresses by actual word count.  
PAYMENT in advance is required for advertising in this column.

### EQUIPMENT FOR SALE

FOR SALE: Milk Coolers, Bottle Coolers, converted Freezers, 1,000 complete High-Sides Frigidaire, Kelvinator 1/4 H.P. to 2 H.P. Motors up to 5 H.P. send for list and price. EDISON COOLING CORPORATION, 310 E. 149th St., New York, N.Y.

AIR CONDITIONING self-contained units, 3 and 5 tons, also 3 and 5 H.P. water cooled condensing units, brand new in original crates, standard make guaranteed by the manufacturer. Delivery at once. EVERLAST, 444 Fourth Avenue, New York City.

DRY BOTTLE COOLERS. ELECTRIC. Equipped with vending machine, blower coil, and self-contained 1/4 H.P. Universal Cooler Corporation unit ready to plug in. Brand new. Streamlined. No priority required. Price \$132.50 net. GENERAL REFRIGERATOR COMPANY, 5400 Eadom St., Philadelphia, Pa.

ICE REFRIGERATED BOTTLE COOLERS. Three-case capacity. Streamlined. All steel, heavily insulated. Casters. Also useful for cooling fish and other products or storing cracked ice in hotels or taverns. Suitable for homes. \$19.00 net each, f.o.b. Philadelphia. Brand new. No priority required. GENERAL REFRIGERATOR COMPANY, 860 North Broad Street, Philadelphia, Pa.

BEER COOLERS, direct draw for 2 half barrels. Brand new. \$325.00, f.o.b. Philadelphia, Pa. Milk coolers, 4 and 6 can capacity. Self contained with General Electric condensing units. 68 cubic foot. Hussman Porcelain reach-in. Call Rittenhouse 6559 or write JORDON REFRIGERATOR COMPANY, 235-237 North Broad St., Philadelphia 7, Pa.

OFFERING QUANTITY of used Frigidaire model K 1/2 H.P. condensing units. All units checked and in running condition; \$34.50. Box 1594 Air Conditioning & Refrigeration News.

100-A.C. 42, type 2A-2, 1/2 H.P., 110 Volt, Model C. Copeland service seal condensing units. Original crates. Available to individual or manufacturer with proper priority. Write or phone OCHILTREE ELECTRIC COMPANY, Atlantic 1900, 21 Penn Avenue, Pittsburgh 22, Pa.

TO TRADE. Three Wagner motors model W22-1351; 1/2 hp.; 115 volts; Direct Current; 1725 RPM. Three Delco Motors model A4831, A4800; Type DM thermatron; 1/2 hp.; 115 volts; Direct Current; 1750 RPM. Trade any or all on even basis for refrigeration type 1/2 or 1/4 hp. motors 110 volt 60 cycle, in good condition. POWERS EQUIPMENT CO., Jenkintown, Pa.

USED REFRIGERATED bottle venders being torn down for refrigeration parts. Refrigeration excellent. Machines include 1/2 hp. Chieftrain compressor; extra 1/2 hp. motor not refrigeration type; finned cooling coil, motor, fan; expansion valve; cold control; other usable parts. Write for price and picture. 110 volt 60 cycle only. POWERS EQUIPMENT CO., Jenkintown, Pa.

WATER COOLERS Ice Refrigerated. Model S, 65 pounds ice capacity \$49.00. Model L 150 pounds \$69.00 net dealer cost f.o.b. Detroit. Price includes coil and glass filler faucet. Construction Stainless steel top, galvanized metal base, welded metal legs. Samples shipped 20% deposit with order, balance C.O.D. SPECIALTIES DISTRIBUTING CO., 525 East Jefferson, Detroit.

**PAR** COMMERCIAL REFRIGERATION UNITS FOR PROTECTION OF VITAL FOOD SUPPLIES  
See Your Par Jobber  
LYNCH MANUFACTURING CORP.  
DEFIANCE, OHIO, U.S.A.

Send for Bulletins on **Wagner** ELECTRIC MOTORS  
MU-182 and MU-183  
Wagner Electric Corporation  
5441 Plymouth Ave. St. Louis 14, Mo., U.S.A.

**GENERAL AUTOMATIC** Pressure, Temperature and Flow Controls  
Write for Catalog 52  
1001 ALLEN AVENUE  
Detroit, Mich.  
GLENDALE 1, CALIF.  
Detroit - Chicago - Dallas  
Denver - San Francisco

**fedders** REFRIGERATION PRODUCTS  
BUFFALO, N. Y.

### EQUIPMENT WANTED

USED EQUIPMENT WANTED: Air conditioning and refrigeration systems and machinery including self-contained units, coils, high-sides, shell and tube coolers and controls. Highest cash for large sizes. We urgently need two 15 HP motors and two compressors without condensers. E. M. FAIRBANKS CO., 475 Fifth Ave., New York 17, N. Y.

### POSITIONS AVAILABLE

RESPONSIBLE MID-SOUTH manufacturer making complete line for Store Installations wants manufacturing executive familiar with Commercial refrigeration who can supervise design and operation of wood working plant manufacturing wall shelving and a complete line of refrigerated Equipment. Operation offers an unusual postwar opportunity. Box 1579, Air Conditioning & Refrigeration News.

WANTED—Experienced engineer by well established, nationally known commercial refrigeration cabinet manufacturer, Midwest. Take complete charge Engineering, Designing, Drafting Department, working close harmony with Sales Department producing postwar products. Can offer to qualified person with permanent place, growing organization with unlimited advancement, salary remuneration — commensurate with proven ability. Box 1597, Air Conditioning & Refrigeration News.

SALES ENGINEERS and draftsmen for industrial refrigeration contracting and manufacturing business. Great variety of work. Excellent postwar opportunities in healthful climate with well established company. GAY ENGINEERING CO., 2730 East Eleventh St., Los Angeles 23, Calif.

EXPERIENCED shop foreman, by old established New York City concern, to rebuild ice-cream cabinets. Write past experience, salary wanted. Box 1586 Air Conditioning & Refrigeration News.

SALES ENGINEER is needed by Central States parts jobber; good salary and commission. This is a permanent position with postwar future. Must have complete knowledge of domestic and commercial refrigeration. Give complete information in your application. Box 1592, Air Conditioning & Refrigeration News.

APPLICATION ENGINEERS. Design Engineers. Prominent manufacturer of commercial refrigeration coils and equipment has opening for experienced, high calibre engineers to design new equipment, re-design prewar lines, and application work. Excellent salary and opportunities for advancement with large, growing, active organization. Box 1585, Air Conditioning & Refrigeration News.

EXPERIENCED commercial refrigeration application engineer interested in permanent postwar position. Opportunity to learn established low temperature field. State experience and qualifications in first letter. Box 1587 Air Conditioning & Refrigeration News.

REFRIGERATION ENGINEER for low temperature development laboratory by well-known mid-west manufacturer of low temperature equipment. Splendid postwar opportunity. State qualifications in detail. Box 1588 Air Conditioning & Refrigeration News.

REFRIGERATION MAN to take charge of Commercial Service Department. Old established firm in a Northern New York city offers a real opportunity for an experienced, ambitious man. Salary and profit sharing arrangements. WATER-TOWN STORE FIXTURES c/o Refrigeration Department, Watertown, New York.

GENERAL ELECTRIC Appliance distributor of commercial refrigeration and household appliance needs an all round permanent service man, interested in a job with a future. Apply COGHLIN ELECTRIC CO., Worcester, Mass.

DESIGNING, PRODUCTION engineer. A man thoroughly experienced in handling complete factory operations, do designing and drafting work, in general commercial refrigeration fixture manufacturing, fifty-eight years in business; give past experience and full information. C. I. PERCIVAL REFRIGERATING CO., Boone, Iowa.

SALES ENGINEERS: We prefer technical graduates with background in heating, ventilation and air conditioning. Several sales territories open for well qualified men in the automatic control field. Must have Statement of Availability. Write fully about yourself including age, education and experience in detail. Box 1595, Air Conditioning & Refrigeration News.

### BUSINESS OPPORTUNITIES

LONG ESTABLISHED refrigeration business in Los Angeles. Representing national manufacturer as distributor. \$25,000.00 required. Box 1593, Air Conditioning & Refrigeration News.

### FRANCHISES WANTED

HAWAII. Organization headed by aggressive staff of trained appliance sales experts. Adequate Capital. Desires contacts with responsible manufacturers. Electrical appliances and allied lines. ELECTRICAL DISTRIBUTORS, LTD., P. O. Box 228, Honolulu 10, Hawaii.

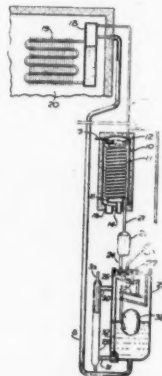
NEW BRANCH, old dealer, wants lines available now and after the war in refrigeration, all branches, serving homes, business establishments. Want food boxes, drink and water coolers, all size refrigerating units. Quote what available and give details on post war items. GULF STATES REFRIGERATION CO., 519 Carondelet, New Orleans 12, La.

## Patents (Cont.)

(Concluded from Page 34, Column 5)

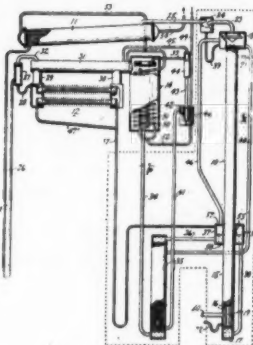
all of said ethane and a portion of said propane in a first expansion chamber, vaporizing the remainder of the propane in a second expansion chamber, mixing the vapors produced in both of said expansion chambers, returning said mixture of vapors to said first zone and reliequifying said mixture to start another cycle of operation.

2,352,798. REFRIGERATION. Cary Miller, Evansville, Ind., assignor to Servel, Inc., New York, N. Y., a corporation of Delaware. Application Sept. 16, 1941. Serial No. 410,970. 6 Claims. (Cl. 62-125).



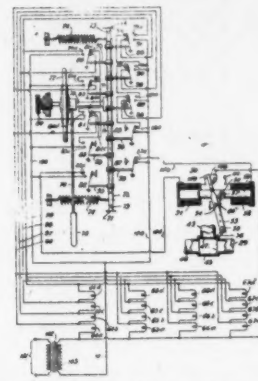
1. A heat transfer system for transferring cooling from a source of refrigeration to a higher elevation including a condenser cooled by said source of refrigeration, an evaporator at said higher elevation, said evaporator always being in open communication with said condenser and connected to deliver vapor to the latter, a vessel connected to receive liquid condensate from said condenser, a conduit for conducting liquid from said vessel upward to said evaporator when said vessel is subjected to sufficient internal pressure to force liquid therefrom through said conduit to said upper elevation, a liquid vaporizer for supplying said pressure in said vessel, said vaporizer being connected to receive liquid from said vessel, and a valve for controlling flow of liquid from said vessel to said vaporizer and operated so that liquid flows to said vaporizer only upon rise in liquid level in said vessel.

2,352,814. REFRIGERATION. Albert R. Thomas, Evansville, Ind., assignor to Servel, Inc., New York, N. Y., a corporation of Delaware. Application July 26, 1940. Serial No. 347,631. 15 Claims. (Cl. 62-119).



10. In an absorption refrigeration system of the kind operable below atmospheric pressure and utilizing a water solution from which water is expelled for use as a refrigerant, an absorber, a generator having one or more riser tubes and in which substantially all of the vapor expelled from solution is utilized to raise solution by vapor-lift action, structure providing a heating space about said tube or tubes, a connection for flowing solution from said absorber to said generator including a liquid downflow conduit, means to supply a heating medium to the heating space for heating said tube or tubes, and said downflow conduit being constructed and arranged to receive heat from the heating medium in said space to effect preheating of solution flowing to said generator, such transfer of heat to the solution flowing to said generator being sufficient to prevent condensate knocking and superheating of solution in the lower part of said tube or tubes, so that normal lifting of solution in said tube or tubes will take place.

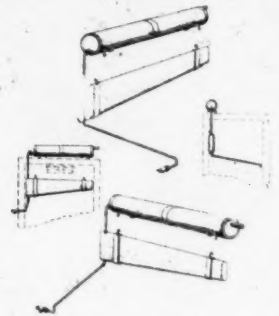
2,352,930. AIR CONDITIONING. Philip F. Anderson, Jr., Evansville, Ind., assignor to Servel, Inc., New York, N. Y., a corporation of Delaware. Application Dec. 9, 1941. Serial No. 422,225. 12 Claims. (Cl. 257-3).



8. An air conditioning system comprising a heating unit and a cooling unit adapted, respectively, for heating and cooling a space to be conditioned, a thermostat including a movable control member responsive to changes in temperature of the space to be conditioned, a first set of contacts successively closed by movement of said control member as the ambient temperature increases from a predetermined value, a second additional set of contacts successively closed by movement of said control member as the ambient temperature decreases from said predetermined value, said control member always having movement through

distances functionally related to changes in temperature, means controlled by the closing of the first contacts of each of said sets by movement of said control member to render said cooling unit or said heating unit selectively operative, and means controlled by the closing of the remaining contacts of each of said sets by movement of said control member to progressively increase the heating or cooling effect of said units.

128,139. DESIGN FOR A BEVERAGE COOLER. Sydney A. Conway, Bloomfield, N. J. Application March 29, 1944. Serial No. 113,059. Term of patent 14 years. (Cl. D67-2).



The ornamental design for a beverage cooler, as shown and described.

## Lois Ferris Promoted By Westinghouse

MANSFIELD, Ohio — Miss Lois Ferris, Westinghouse home economist for two years, has been appointed Pacific coast district home economist for the company, it is announced by Mrs. Julia Kiene, director of the Westinghouse Home Economics Institute.

Miss Ferris will succeed Mrs. Betty Lake Jordan, who resigned to devote full time to her family and home. The Westinghouse Pacific coast district includes California, Washington, Oregon, Utah, Nevada, Idaho, Montana, and parts of Wyoming and Arizona.

## Imperial Brass Issues New Parts Catalog

CHICAGO—A new condensed catalog describing the Imperial line of refrigeration and air conditioning valves, fittings, service tools, dehydrators, and allied items has just been issued by The Imperial Brass Mfg. Co.

The catalog includes such recently introduced items as the multi-size "Double Flaring" tool for thin-wall steel tubing (such as Bundy), a double flaring tool for plastic tubing and a self-clamping flaring tool.

The new catalog is designated 88-L and copies are available from the manufacturer on request.

**REFRIGERATION PRODUCTS**

Write for New Catalogue

Humi-Temp Forced Convection Units—Patented CROSS-FIN COILS—Bare Tube Coils—Zinc Fused Steel Plate Coils—Disseminator Pans—Heat Exchangers—Evaporative Condensers—Instantaneous Water Coolers—Air Conditioning Coils—Industrial Units

LARKIN COILS, Inc., 519 Memorial Dr., S.E., Atlanta, Ga

★ Meet DOYLE CARPENTER, who before the war served the Tyler Fixture Corporation as Field Representative in the Central States from Michigan to the Gulf. "Carp" had scores of friends in the commercial refrigeration field and certainly knows his stuff. Now he is CMP Manager and Expediter but after the war will be back on the old trail heading South.

**TYLER**

**Henry** "Y" Strainer

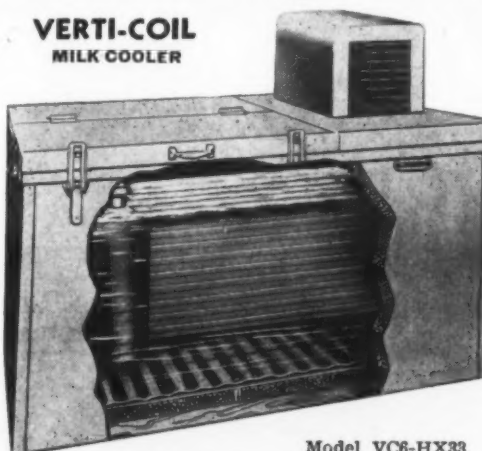
Exceptional design. Hot tin dipped welded steel construction with copper end connections (steel in F.P.T. sizes). Negligible pressure drop. Large screen area with easily removable screen. Light weight. Oil trapping prevented by installing on side or in vertical position.

**ASK YOUR JOBBER FOR IT**

**Henry Valve Co.**  
1001-19 N. SPAULDING AVE.  
CHICAGO

## Are You Getting Your Share of the Milk-Cooling Business?

### VERTI-COIL MILK COOLER



Model VC6-HX33  
Packaged-Unit

## WILSON

SYSTEMS OF MILK COOLING  
A TYPE FOR EVERY REQUIREMENT

### 2. VERTI-COIL MILK COOLER

• Wilson VERTI-COIL Milk-Cooling Cabinet (U.S. Pat.) integrates in its design the tremendous cooling action of the Verti-Coil Prime Surface Plate Coil to provide a positive non-mechanical circulation of the refrigerated water bath. . . Effectively cools all of the milk, including the hard-to-cool top milk where spoilage starts.

• The Wilson Cabinet is "Life-Tested" for long efficient life.

Thousands of dairymen have bought, thousands more will buy, WILSON MILK COOLERS. A share of this business can be YOURS . . . If there is no Wilson Dealer near you . . . If you have a modern organization . . . write NOW!

**WILSON CABINET COMPANY**  
COMMERCIAL REFRIGERATION  
SMYRNA DELAWARE



## G-E Bloomfield Chief



**G. R. PROUT**  
Mr. Prout was recently appointed manager of the air conditioning and refrigeration division of the General Electric Co. at Bloomfield, N. J. He was previously manager of the G-E industrial control division.

## Rules Are Given on Experimental Models

(Concluded from Page 1, Column 3)  
cently approved by WPB to provide a basis for eventual reconversion and such extra civilian production as can be undertaken meanwhile without interfering with war output. It permits the manufacture of experimental models so that industry may develop new products which are superior to or cheaper than present models.

To assure that production of experimental models does not interfere with output of war and essential civilian goods, WPB has provided, in addition to the requirement that labor and manpower may not be diverted, that:

1. Only the minimum number and minimum size of models necessary to prove the suitability of the article for commercial production or use may be made. This does not permit trial production runs of experimental models.
2. Materials made available specifically for another purpose may not be used to make experimental models.
3. Models may not be distributed to promote sales or create demand, and shall not be displayed to the trade or the public. Production of samples is specifically prohibited.
4. Models of houses, buildings, or structures involving construction may not be made under the rules. Experimental construction jobs will continue to be governed by provisions of Order L-41.

## Bullock Heads Up G-E Appliance Advertising

(Concluded from Page 1, Column 5)  
Later he became an instructor in tactics there.

At the time of his discharge he was commanding officer of officers' school at Fort Custer, Mich.

Mr. Bullock was a second lieutenant in World War I. When the war ended he returned to the University of Illinois where he was student colonel of his R.O.T.C. brigade. Following his graduation in 1922 he continued his army affiliation as a reserve officer. He was appointed a major in 1937.

His record of over 20 years with General Electric Co. started in the publicity department at Schenectady, where his first assignment was market research and analysis. Then came a three-year dealer promotional job dealing with the increasingly serious problem of distributing catalogs, handbooks, sales aids, direct mail, and similar publicity material.

He was then placed in charge of the company's institutional advertising program, and in 1930 was appointed division manager responsible for advertising products sold to electric service companies. In 1933 he was appointed assistant to the manager of the publicity department, and shortly afterward assistant manager. In 1939 he was appointed advertising manager of the appliance and merchandise department at Bridgeport.

## Retail Pricing Rules To Be Considered

NEW YORK CITY—A draft of a proposed simplified price regulation to apply to most retail stores, except food stores, will be presented to OPA's Retail Council in New York City, Aug. 29, the Office of Price Administration announced last week.

During a meeting of the task committee of the Retail Council and OPA officials, held in Washington, July 18 and 19, further progress was made in working out the technical difficulties of such a simplified price regulation.

The complete task committee will meet in New York, Aug. 28, to go over this draft of the new regulation in its final form before it is presented to the Retail Council on the following day.

In general, the plan for this new regulation incorporates the principle of price control based on retailers' historic pricing practice together with necessary safeguards for holding retail prices at levels no higher than present, legal levels.

## Firm 'For Veterans' Will Make Freezers

(Concluded from Page 1, Column 5)  
as soon as wartime barriers are let down."

Heading the new company is Robert S. Flannigan, a mechanical engineer and veteran of World War I. According to Mr. Flannigan, the concern will buy motors and parts from manufacturers and assemble them with a force of 150 workers. Ultimately a sales force of 800 will be employed, he said.

## Norge Distributorships Jump 37% During War

DETROIT—Norge division of Borg-Warner Corp. has increased its distributorships 37% during the war, it has been disclosed by M. G. O'Harra, vice president in charge of sales.

O'Harra explained that the firm, while holding its original organization intact, had added 22 new distributors throughout the nation with the result they now total 80 as compared with 58 before the war.

Meanwhile, O'Harra revealed that Norge distributor and dealer attendance at the recent furniture market in the American Furniture Mart in Chicago had showed a substantial increase from preceding wartime shows, "indicating that the individual distributor and dealer is planning as

seriously for postwar business as is the manufacturer."

Surveys of consumer wants have been conducted by the "Norge Jury of Marketing Opinion," a fact-finding group composed of 2,600 Norge distributors and dealers, O'Harra explained.

Citing the example of the refrigerator, he detailed the procedure which has been followed to obtain desired information. Questions concerning such things as interior finish, sliding shelves, location of evaporator, and interior size were put to the dealers who in turn carried out their own surveys among customers. The same process has been applied on other products.

"The result has been," O'Harra said, "that we here in the offices have a pretty good idea of what type or types of refrigerators will receive the greatest consumer acceptance when we get back into production."



## G I R D L I N G the G L O B E

"Join the Navy and see the world." It's just as true of the doughboys . . . the fliers . . . the merchant marine . . . all of the services. And our men . . . and women . . . are learning more than geography. They're learning about refrigeration. It touches them where they live . . . their chow. It contacts them on flattops . . . on battle-wagons . . . in field hospitals. From palms to pines . . . from Greenland to Guadalcanal . . . from Burma to Belfast . . . our services are learning fast, and much, and RIGHT. And youth is open to new ideas.

Hitler has halted. Tojo has tumbled. When Johnny . . . and Jeannie . . . come marching home they'll know all about what refrigeration will do. They'll know a lot about refrigeration. And they'll know a lot about BUSH! And they'll WANT it.

Refrigeration will play a major role in the post-war world. Development, economists tell us, will be comparable to that of the automobile after World War I. Refrigeration will enter transportation as never before . . . it will revolutionize the processing and merchandising of food products . . . it will open whole new markets in industry, virgin territory for the refrigeration engineer. Days now will mean dollars to you later. You're on your marks. We're telling you to GET SET.

The Bush Manufacturing Company, Hartford, Connecticut . . . 415 Lexington Avenue, New York . . . 549 W. Washington Blvd., Chicago . . . Export, 13 East 40th Street, New York . . . Cables: "ARLAB"

BUY WAR BONDS

PENGUIN PETE



# Bush

HEAT TRANSFER PRODUCTS